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Oliver Goldsmith

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A HISTORY

OF

THE EARTH

AND

ANIMATED NATURE.

BY

OLIVER GOLDSMITH.

VOL. 1.

WITH NUMEROUS ADDITIONAL NOTES.

A. FULLARTON & Cº LONDON, EDINBURGH & DUBLIN.

A HISTORY

OF THE

EARTH AND ANIMATED NATURE,

BY

OLIVER GOLDSMITH.

With an Introductory View of the Animal Kingdom, Translated from the French of Baron Cuvier,

AND COPIOUS NOTES

EMBRACING ACCOUNTS OF NEW DISCOVERIES IN NATURAL HISTORY;

A LIFE OF THE AUTHOR,

BY WASHINGTON IRVING;

AND

A CAREFULLY PREPARED INDEX TO THE WHOLE WORK.

IN TWO VOLUMES.

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PUBLISHERS' ADVERTISEMENT.

CONSIDERABLY more than half-a-century has elapsed since Goldsmith's HISTORY OF THE EARTH AND ANIMATED NATURE was first published; and although it has gone through many editions, such is the charm of the work, that the demand for it continues undiminished. The art which Goldsmith eminently possessed of saying every thing he had to say in a pleasing manner,—the fascinating ease and beauty of his style,—and the simple and intelligible arrangement which he adopted,—secured for his work an extensive and steady patronage; and well did the result prove the correctness of Dr. Johnson's anticipation, when he said, "Goldsmith is now writing a Natural History, and he will make it as entertaining as a Persian tale." Goldsmith's work, indeed, did much to render Natural History a popular study in this country. It is true, he cannot be classed with a Buffon, a Linnæus, a Cuvier, and other great naturalists; yet if it may not be affirmed of him that he added much to the science itself, it must nevertheless be allowed that he was the first English writer who, by the inimitable graces of his style and manner, threw a charm over the subject which was new to the English reader, and the effect of which, in rendering the science of Natural History popular, has been great and extensive. With all its attractions, however, his work is not free from errors, and cannot at this day be regarded as complete or scientific in its system. To correct its mistakes, and supply its deficiencies, has been a leading object in the present edition; and while the original text of Goldsmith—which has so long delighted the general reader—has been faithfully retained, and purged from many corruptions by careful collation with the second edition of the work, published in the Author's lifetime, such additions have been made to it, in the shape of NOTES, as the present improved state of science calls for.—To the present edition have been added a LIFE OF GOLDSMITH, from the pen of WASHINGTON IRVING, and a careful translation of BARON CUVIER'S INTRODUCTORY VIEW OF THE ANIMAL KINGDOM, with additions from the pen of an eminent Naturalist.

INTRODUCTORY VIEW
OF THE ANIMAL KINGDOM,

BY BARON CUVIER.

AN INTRODUCTORY VIEW

OF

THE ANIMAL KINGDOM.

SECT. I.—NATURAL HISTORY IN GENERAL, AND METHODS OF ARRANGEMENT.

e—Division of the Physical Sciences—Natural History—General Principles—Conditions of stence, or Final Causes—Observation—Classification—Artificial or Natural—Subordination haracters.

deem it necessary to commence our work by clearly defining the object of ral History, and by establishing a precise line of demarcation, so as to separate science from others to which it is nearly allied. This is the more requisite, as ised and indistinct notions on the subject very generally prevail.

rious significations have been applied to the term *Nature*, in our language as as in most others;—sometimes it denotes the qualities of a being derived from ial constitution, as distinguished from those acquired by art;—sometimes it fies the vast concourse of beings composing the universe;—and sometimes the which govern those beings. It is especially in this last sense that we are tomed to personify Nature; and, from a proper feeling of respect, to use this for the name of its divine Author. Physics, or Physical Science, may consider e in any of these three points of view.

name of the Supreme Being, which never ought to be pronounced without emotion, could introduced into philosophical discussions upon every occasion, without a violation of decorum. dingly, it has become an established practice to use the milder term *Nature*, as an appellation ilar import. This is done without any intention of deifying the powers of nature. On the ry, the best and wisest natural philosophers agree with Dr. Clarke in considering "that there uch thing as what we commonly call the course of nature, or the power of nature. The of nature, truly and properly speaking, is nothing else than the will of God, producing cer-fects in a continued, regular, constant, and uniform manner, which course or manner of acting in every moment perfectly arbitrary, is as easy to be altered at any time as to be preserved. t all those things which we commonly say are the effects of the natural powers of matter and f motion, of gravitation, attraction, and the like, are indeed (if we will speak strictly and ly) the effects of God's acting upon matter, *continually* and *every moment*, either immediately nself, or mediately by some created intelligent being." In these and following passages, the *law* is used in a metaphorical sense. An ordinary law of civil society is addressed by an in-nt legislator to persons, capable both of understanding the meaning of the law, and of regu-their actions accordingly. But, when we use the phrases *law* of vegetable life, *law* of gravita-t is evident that the word is used in a sense widely different from the former. Nature, that Supreme Being, not only prescribes the law, but executes it; a *law of nature* being nothing than that particular regular mode of acting which the Deity has prescribed to himself.

ysical science is either general or particular.

en we deduce effects from causes, and by explaining the various phenomena of Nature, obtain wer of applying the materials she presents to purposes useful to mankind, it is termed *Gen-hysics*, or *Natural Philosophy;* but, when we consider the various objects presented by Nature, simply for the purpose of obtaining a knowledge of their order, their arrangement, and the disposition of their parts, without referring effects to their causes, it is termed *Particular Physics*, or *Natural History*. It thus appears, that while Natural Philosophy is the ultimate object of science, Natural History is the source whence all science must necessarily arise. The former is unrivalled for sublimity of ideas and depth of investigation, the latter for variety of character and interest in its details. While Natural Philosophy is best fitted to occupy the mind in its severer moments, Natural History affords an agreeable relief, by the general beauty of its objects, the elegance of their forms, the richness of their colouring, the singularity of their habits and instincts, and the exquisite adaptation of all their parts. Both alike lead us to form elevated and enlightened conceptions of the power and beneficence of the Creator.

General Physics examines, in an abstract manner, each of the properties of those moveable and extended bodies, to which we apply the general term *matter*.

That branch called *Mechanics* considers the particles of matter as collected in masses, and deduces mathematically, from a very small number of experiments, the laws of equilibrium, of motion, and of its communication. Its several divisions take the names of Statics, Dynamics, Hydrostatics, Hydrodynamics, Aerostatics, &c., according to the nature of the bodies, the motions of which are under examination.* Optics considers solely the peculiar vibrations of light; but in this science various phenomena, ascertained entirely by experiment, are daily becoming more numerous.

Chemistry, the other division of General Physics, explains the laws, by which the elementary particles of bodies act on each other, at indefinitely small distances; the combinations or decompositions resulting from the affinity of their ultimate elements; and the manner in which the operation of affinity is modified by various circumstances, capable of increasing or diminishing its action. Being chiefly an experimental science, it cannot, on that account, be classed with others more exclusively mathematical.

The theories of heat and electricity may belong almost equally to Mechanics or to Chemistry, according to the point of view in which each of them is considered.

The mode of proceeding adopted in all the departments of General Physics is, to consider, either mentally or experimentally, only a small number of the properties of bodies at once, in order to reduce them to the greatest attainable simplicity; then, to calculate or discover the effects resulting therefrom; and finally, to generalize and incorporate the laws of these properties so as to form series of theorems; and, if possible, to resolve them into one universal principle, which will serve as a general expression for them all.

Particular Physics, or Natural History (for both of these terms are used indiscriminately), may [be extended so as to] include the particular application of the laws, ascertained by the different branches of General Physics, to the numerous and diversified created beings existing in nature, in order to explain the phenomena which each exhibits. When used in this extensive signification, it also includes Astronomy; but this latter science, being fully elucidated by the light of Mechanics alone, is entirely subservient to its laws, and employs methods of investigation, too different from those admitted by Natural History, to be [extensively] cultivated by the same persons. It is usual, also, to include Meteorology among the branches of General Physics, and to confine Natural History to objects which do not admit of rigorous mathematical investigation, or precise measurement in all their parts.

Geology ranks next to Astronomy for the sublimity and depth of its investigations, and ought, logically, to be classed with Natural Philosophy. But the science is based upon so vast a mass of historical detail, and is still so much in its infancy, that it will long continue to be arranged with the branches of Particular Physics. It contrasts with Astronomy in this respect, that while the last-mentioned science leads us to explore the infinity of space, Geology unfolds the secrets of the infinity of past time. In the one, the *present place* of man is considered but as a point in the vast regions of space; in the other, the *present time* but as an instant in the middle of two infinities —time past and time to come.

Natural History properly considers only the inorganic bodies called Minerals, and the various kinds of living beings [called Animals and Plants], almost all of which are under the influence of laws, more or less unconnected with those of motion, of chemical affinity, and of various others, analyzed in the several departments of General Physics. We ought, in treating of Natural History, to employ precisely the same methods as in the General Sciences; and, therefore, we endeavour to adopt them, whenever the subjects under examination become sufficiently simple to permit that mode of investigation. But as this is seldom practicable, there arises, hence, an essential difference between the General Sciences and Natural History. For, in the former, the phenomena are examined under circumstances completely within the reach of the inquirer, who arrives, by analysis, at general laws; while, in the latter, they are removed, by unalterable conditions, beyond his control. In vain he attempts to disengage them from the influence of general laws, already ascertained. He cannot reduce the problem to its elements, and, like the experimental philosopher, withdraw successively each condition; but he must reason upon all its conditions at once, and only arrive, by conjecture, at the probable result of such an analysis. Let him seek to ascertain, by direct experiment, any one of the numerous phenomena essential to the life of an animal, though but slightly elevated in the scale of being,

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* In this, and in similar passages, we have thought it more agreeable to received usage to transpose the terms Mechanics and Dynamics from the position in which they stand in the original, the former being, as we conceive, the more general term.—*Translator*.

"And ere he touch the vital spark—'tis fled."

Thus, it appears that, while Mechanics has become a science chiefly of CALCULATION, and Chemistry of EXPERIMENT, Natural History will long remain, in most of its departments, a science wholly of OBSERVATION.

The latter part of this remark must, however, be restricted to the early stages of Natural History; because, in its more matured condition, it becomes a science of demonstration. Every branch of physics has one leading object in view, and that is, the discovery of the ultimate laws of Nature. Philosophy regards this as of primary importance; while utility is held only as of secondary rank. Science, in its most comprehensive sense, is a superstructure founded on facts, or acquired by experience; and hence, in its early stages, we consider it as entirely limited to observation: but when we have learned to generalize, and find that truths agree in their several relations, we have arrived at the demonstrative part of the science. It is not, therefore, from a mere knowledge of correct nomenclature, or from a capacity to recognise at sight a natural object, that we are entitled to apply the name of *scientific* knowledge to Natural History; but only when we have succeeded, by observation, in deducing the laws which regulate these objects, in their relations to surrounding beings.

These three terms, Calculation, Observation, and Experiment, express, with sufficient accuracy, the manner of cultivating the several branches of Physical Science; but, by exhibiting among them very different degrees of certainty, they indicate at the same time, the ultimate point to which Chemistry and Natural History ought to tend, in order to rise nearer to perfection. Calculation, in a manner, sways Nature: it determines the phenomena more exactly than can be done by observation alone; Experiment obliges Nature to unveil: Observation watches when she is refractory, and seeks to surprise her.

Natural History employs with advantage, on many occasions, a principle of reasoning peculiar to itself, termed *the conditions of existence*, or, more commonly, *final causes*. As nothing can exist except it contains within itself all the conditions which render existence possible, it is evident, that there ought to be such a mutual adaptation of the various parts of each being among themselves, and such an accommodation of their structure to the circumstances of surrounding beings, as to render possible the existence of the whole. The analysis of these conditions often leads to the discovery of general laws, with a clearness of demonstration, surpassed only by the evidence of direct experiment or calculation.

It was by the knowledge of this principle, that the celebrated Dr. William Harvey was enabled to discover the circulation of the blood in man. The Honourable Robert Boyle relates his conversation with Dr. Harvey on this subject, in the following words:—"I remember, that when I asked our famous Harvey, in the only discourse I had with him (which was but a little while before he died), what were the things which induced him to think of a circulation of the blood? he answered me, that when he took notice that the valves in the veins of so many parts of the body were so placed, that they gave free passage to the blood towards the heart, but opposed the passage of the venal blood the contrary way, he was invited to think that so provident a cause as Nature had not placed so many valves without design: and no design seemed more probable than that, since the blood could not well (because of the interposing valves), be sent by the veins to the limbs, it should be sent through the arteries and return through the veins, whose valves did not oppose its course that way." It is evident from this, and many other similar instances, that, in examining the subjects of Natural History, we shall best advance the science, by considering attentively the uses and ends designed by Nature in their formation, and the functions which their organs are destined to perform. This manner of investigation has been objected to by some philosophers, among whom is Des Cartes, as being a presumptuous attempt on the part of human reason, far above its powers, to penetrate into the secret designs of the Creator. The following passage, extracted from the works of Mr. Boyle above quoted, forms a satisfactory answer to this objection:—"Suppose that a countryman, being on a clear day brought into the garden of some famous mathematician, should see there one of the curious gnomonic instruments, that show at once the place of the sun in the zodiac, his declination from the equator, the day of the month, the length of the day, &c., &c., it would indeed be presumptuous in him, being unacquainted both with the mathematical disciplines, and the several intentions of the artist, to pretend or think himself able to discover *all the ends* for which so curious and elaborate a piece was framed: but when he sees it furnished with a style, with horary lines and numbers, and, in short, with all the requisites of a sun-dial, and manifestly perceives the shadow to mark from time to time the hour of the day, it would be no more a presumption than an error in him to conclude, that (whatever other uses the instrument was fit or was designed for), it is a sun-dial, and was meant to show the hour of the day." The whole science of Natural History teems with instances, showing the successful application of the general principle called the conditions of existence. Thus, when we see an animal possessed of a capacious stomach, long intestines, and a massive structure, we may safely infer that it is *herbivorous*, or feeding on vegetables, slow in its movements, and of timid and gentle habits. On the contrary, when we find an animal with short intestines, straight stomach, and armed with weapons of offence, we immediately conclude it to be *carnivorous*, or feeding upon flesh, and of a fierce and active disposition.

It is further observed by the author, in his Lectures on Comparative Anatomy, that the construction of the alimentary canal determines, in a manner perfectly absolute, the kind of food on which the animal is nourished. For, if the animal did not possess, in its senses and organs of motion, the means of distinguishing the kinds of aliment suited to its nature, it is obvious that it could not exist. An animal, therefore, which can only digest flesh, must, to preserve its species, have the power of discovering its prey, of pursuing, of seizing, of overcoming, and of tearing it in pieces. It is necessary, then, that the animal should have a penetrating eye, a quick smell, a swift motion, address and strength in the jaws and talons. Agreeably to this necessity, a sharp tooth, fitted for cutting flesh, is never co-existent in the same species with a hoof covered with horn, which can only support the animal, but cannot grasp any thing: hence the law, according to which all hoofed animals are herbivorous, and also those still more detailed laws, which are but corollaries to the first, that hoofs indicate molar teeth or grinders with flat crowns, a very long alimentary canal, with a capacious and multiplied stomach.

It is only after having exhausted all the laws of General Physics, and the conditions of existence, that we are compelled to resort to the simple laws of observation. The most effectual mode of deducing these is by comparison; by observing the same body successively in the various positions in which it is placed by Nature; and by comparing different bodies with each other, until we obtain a knowledge of some constant relations between their structure and the phenomena exhibited by them. These various bodies thus form a species of experiments, performed entirely by Nature's hand, where different parts of each are supplied or abstracted, as we would desire to treat them in our laboratories: and the results of these additions or abstractions are presented to us spontaneously. We are thus enabled to deduce the invariable laws influencing these relations, and to apply them in a manner similar to the laws determined by general physics. Could we but incorporate these laws of observation with the general laws of physics, either directly or by means of the principle called the conditions of existence, the system of natural science would be complete, and the mutual influence of all beings would be perceived throughout the whole. To approach this great end the efforts of naturalists should be steadily directed.

All researches of this kind presuppose that we have the means of distinguishing with certainty, and of describing to others with accuracy, the objects under investigation; otherwise, we shall be continually liable to fall into confusion, amidst the innumerable beings which surround us. Natural History ought, therefore, to have for its basis, what has been technically termed *a system of nature*, or a methodical and extensive catalogue, arranged with divisions and subdivisions, in which all beings shall bear suitable names and distinct *characters.*[*] That we may always be able to discover the character of any particular being from knowing its name, or the name from knowing its specific character, we must found this peculiar description upon some essential or permanent properties of the being. We must not derive the character from habits, or colour alone, as these properties are ever liable to be modified by external circumstances, but from INTERNAL ORGANIZATION or COMPOSITION.

When Natural History was in its infancy, the objects were few and easily remembered. Systems of classification were either neglected as unnecessary, or confined only to those general divisions and subdivisions, which it was impossible to overlook. But ever since the days of Aristotle, A. C. 330, when Alexander the Great had increased the number of known species of animals by some of the productions of the conquered East, the necessity of a precise system of classification has been universally admitted; and now, the progress of geographical knowledge has enlarged the bounds of the science to so vast an extent, and disclosed a variety so inconceivable of forms hitherto unknown, that the naturalist would, without classification, be overwhelmed with endless details. Yet the different kinds of animals are daily becoming more numerous by the contributions of enlightened travellers. In 1750, the number of distinct species of insects was estimated at 20,000, and now it cannot be less than 100,000. And when it is considered how small a part of the globe has been carefully examined, when there are vast tracts in the interior of Asia, Africa, America, and the isles of the Southern Ocean, which have never been trod by civilized man, while many portions, even of Europe, are but superficially explored, and when the depths of the vast ocean present insuperable barriers to investigation, we may reasonably expect, that the whole number of species will be found to be very much greater. Improved microscopes have disclosed myriads of animalcules previously unknown, and almost every fluid contains an enormous variety of distinct forms, many of them peculiar to each kind of liquid. All this apparent chaos is by the art of the naturalist reduced to a beautiful system, and immediately one universal principle of order may be traced throughout the whole.

Scarcely any object in nature is so peculiar in its formation, as to be at once defined by any single trait in its character. We are almost always under the necessity of combining many of these peculiarities, in order to distinguish an object from others to which it is nearly allied; especially when these allied objects possess some, though not all, of its peculiarities, or when these peculiarities are united to other properties of a different character. The more numerous the objects are which have to be distinguished, the more it becomes necessary to multiply the terms of their several characters; so that, without some contrivance, they would become descriptions of inconvenient length. To remove this objection, divisions and subdivisions are employed. A certain number of allied species are collected together into one group, and it then becomes necessary only to express, for their respective characters, the points wherein they differ, which, according to the above supposition, form but a small part of their description. The whole group is termed a *genus.* The same difficulty would be experienced in distinguishing the genera from each other, if we did not repeat the operation, by grouping the allied genera to form an *order;* and then assembling the allied orders to constitute a *class.* Subdivisions intermediate to these are established when necessary. This aggregation of divisions, in which the superior contain the inferior, is termed a *system* or *method.* It may be compared, in some respects, to a dictionary, wherein the properties of things are an index to their names, being the reverse of ordinary dictionaries, in which the names are given, as an index to their meanings or properties.

Thus it appears, that a collection of individuals of the same form
constitute..........a species,
Of species..........a genus,
Of genera..........an order,
Of orders..........a class,
And of classes..........a kingdom.

To explain this arrangement more clearly, we shall take an example from the Animal Kingdom; suppose, the horse. This animal belongs to the class *Mammalia,* containing all which suckle their young; to the order *Pachydermata*, or thick-skinned animals, such as the elephant, boar, and rhinoceros; and to the genus *Equus*, composed of animals with solid hoofs, as the ass and zebra. From these allied species it is finally distinguished by the term *caballus*. Thus, the scientific name of the horse is *Equus caballus*, terms derived from its genus and species. But, as different naturalists often give different names to the same animal, it becomes necessary to add to these the name of the naturalist who first introduced the generic and specific names. In the above example, we therefore write *Equus caballus*, LINN. for the celebrated naturalist Linnæus.

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[*] The word *character,* in Natural History, denotes that peculiar description of an object which distinguishes it from all others. Thus we say, the character of *man* is, "Teeth of three kinds, posterior extremities furnished with feet, anterior with hands, &c. &c."—*Translator.*

Such is the method indispensably required, in framing the arrangement of the almost unbounded objects of Natural History.

We need scarcely caution our readers against the errors of the Realists, once the cause of so much contention in the schools. The individuals alone, or more properly the particles composing each individual, have a real existence in nature, while species, genera, &c. are but general words, invented by man, to express certain points of resemblance, which he perceives among their properties.

There are two different principles observed in the formation of systems of arrangement, according as they are intended to be *artificial* or *natural*. The design of an artificial system is to enable the student to find *the name* of an object, whose properties are known, and to this alone its utility is, in general, confined. Thus, Linnæus arranged plants, chiefly according to the number and situation of the stamens and pistils contained in their flowers. But, being founded on the comparison of only one single organ, the artificial method conveys no general knowledge of other properties, and frequently separates objects which ought never to be disjoined. It is altogether different with a *natural* method. Its divisions are not founded upon the consideration of a single organ, but are derived from characters presented by all the parts of the object. Accordingly, the objects are disposed in such a manner, that each bears a greater affinity to that which immediately precedes and follows it, than to any other.

When this method, therefore, is good, it is not confined to a mere list of names. If the subdivisions have not been selected arbitrarily, but rest upon real and permanent relations, and upon the essential points of resemblance in objects, the natural method is the means of reducing the properties of beings to general laws, of expressing them with brevity, and of fixing them permanently on the memory. To produce these results, objects must be assiduously compared under the guidance of another general principle, necessarily proceeding from that of the conditions of existence formerly explained, called *the subordination of characters*, which we shall here briefly elucidate. The several parts of a being having a mutual adaptation, there are certain constitutional arrangements which are incompatible with others; again, there are some with which they are inseparably connected. When, therefore, certain peculiarities belong to an object, we may calculate with facility what can, and what cannot, co-exist with them. We, accordingly, distinguish by the terms *important* or *leading characters*, those parts, properties, or constitutional arrangements, having the greatest number of these relations of inconsistency, or of necessary co-existence; or, in other words, which exercise upon the whole being the most marked influence. Others of minor importance are termed *subordinate characters*. The superiority of characters is sometimes determined in a satisfactory manner, by considering the nature of the organs described in the character. When this is impracticable, we must resort to simple observation; and, from the nature of a character, must infer such to be the most decided as are found the least liable to vary, when traced through a long series of beings, differing in degrees of resemblance. For this reason, we should select for the grand divisions, those characters which are at once important and permanent; and may reserve, with propriety, the subordinate and variable characters for the minor subdivisions of our system.

There can be but one complete system, and that is, the natural method. Here species of the same genus, order, or class, resemble each other more than they do the species of any other corresponding division; the place of each object is decided by its relation to surrounding beings; [and the whole arrangement forms a type of that beauteous system of nature which, "changed thro' all, thro' all remains the same." Even Linnæus, who framed the best artificial system ever presented to the world, observes, in his Philosoph. Bot. § 77, that natural historians should regard the natural method of arrangement as the ultimate aim of their labours.

In a word, the natural method is the very soul of Natural History

"Unerring nature, still divinely bright,
One clear, unchanged and universal light."]

SECT. II.—OF LIVING BEINGS, AND OF ORGANIZATION IN GENERAL.

*ts definition—Death—Organization—Generation—Spontaneous Generation—Reproduction—
Species—Varieties—Permanence of Species—Pre-existence of Germs.*

)eing the most important of all the properties of created existence, stands first
scale of characters. It has always been considered the most general principle
sion; and, by universal consent, natural objects have been arranged into two
se divisions, ORGANIC beings [comprising animals and plants], and INORGANIC
[comprising minerals].

vord *Life* is used under two significations which are often confounded. It may be applied
as a general term to express, with brevity, the various phenomena peculiar to living beings;
y signify the *cause* of these phenomena. It is in the latter sense that the terms *vital prin-*
principle of life, are employed; being, in this respect, perfectly analogous to the terms
heat, attraction, and electricity, which are used in the general sciences under a twofold
tion,—the one physical,—the other metaphysical. But, it is with the phenomena alone,
hysical sense of these terms, that Natural Philosophy has any concern. The knowledge of
s removed far beyond the reach of human reason; and, by neglecting to discriminate be-
hese two senses, ancient philosophers before Lord Bacon, and too many modern ones since
e, have fallen into endless discussions, and obscured the light of real science. Yet, it is
, upon a subject so interesting as life, in which we all feel deeply concerned, to restrain
within the bounds of reason and philosophy. A recent anonymous writer asks, "Who has
to himself the question, 'What is life?' Who would not receive a clear and just solution
nquiry, with a feeling of interest, far beyond that afforded by the successful result of any
scientific investigation? We can comprehend part of the mechanism by which life acts;
its result. We see that mechanism to be so delicate, so complicated, so fragile, so easily set
while our interest is so deep that it should act well, and permanently well, that the exqui-
of adjustment, the skill of contrivance, and the completeness with which the intended
secured—all subjects of distinct and interesting investigation—only increase the earnest-
our wish, that we could see beyond the mechanism, and understand that, which it is
ed us to know only by examining its phenomena.

do not commonly consider *how much* is given us in life,—the daily enjoyment of the boon
us insensible to the variety and plenitude of its richness. We shall become more sensible
on contemplating the various tissues of organic particles that have been formed; the num-
roperties that are attached to each; the number of organs that are constituted by their
tion and arrangement; the number of functions that are exercised by those organs; and
ber of adjustments by which all are combined, harmonized, and made effectual to the pro-
of one grand result. It is then we perceive how many things must exist, how many rela-
ust be established, how many actions must be performed, how many combinations of actions
secured, before there can be sensation and motion, thought and happiness."

attempts have been made to account for the vital principle, but hitherto all these have
abortive. It is possible, that various functions of the animal frame may hereafter be dis-
to proceed from mechanical or from chemical laws; but, we believe, that the ultimate
of the phenomena of life will ever remain concealed from human knowledge.

rder to form a just idea of the essential conditions of life, we must first examine
eings which are the most simple in the scale of creation; and we shall readily
e that these vital conditions consist, in a power possessed by certain bodies,
eriod of time only, of existing in a determinate form; of continually drawing
eir composition a part of the surrounding substances; and of returning back,
influence of the general laws of matter, certain portions of their own materials.

phenomena are exhibited by the *conferva rivularis*, a small bundle of green filaments, finer
ir, found in rivulets and stagnant pools. Being without root or leaves, it is simply attached
ad surface to the margin of the water. While life exists, it increases in size and weight,
out filaments like branches, assimilates the particles of water, and of other inorganic sub-
around it, into vegetable matter, and lays them down in an oblong cellular form. In ani-
d plants, nutrition is the effect of an internal power; their growth is a development from
In minerals, on the contrary, growth goes on by the external deposition of successive
r layers; whilst organized bodies, by means of their vital power, grow and increase by the

assimilation of different substances. The *stalactite*, once supposed to be an exception, is now proved to be subject to the ordinary laws of inorganic matter.

Thus life may be compared to a whirlpool of variable rapidity and intricacy, drawing in particles of the same kind, and always in the same direction; but where the same individual particles are alternately entering and departing. The form of living bodies seems, therefore, to be more essentially their own, than the matter of which they are composed.

The matter forming the bones of animals has been ascertained to undergo a very considerable change in a few days; and from this fact the probability of a corresponding change in the other parts of the frame is inferred. The very singular rapidity with which this change is effected was accidentally discovered. Certain animals were fed with madder (*rubia tinctorum*), a plant cultivated for its red dye; and in twenty-four hours all their bones were found to be deeply tinged with its colour. On continuing the same food, the colour became very deep; but upon leaving it off, the colour was completely removed in a very few days. By alternately changing the food, the bones were found to be marked with concentric rings of the red dye, according to the number of times that the change was made. These phenomena, so far surpassing any thing that could have been anticipated, are well calculated to convey an idea of the extraordinary rapidity with which the particles of the animal frame are removed, while the form remains without any apparent alteration.

While this movement continues, the body wherein it takes place LIVES; when it entirely ceases, the body DIES. After death, the elements which compose the living frame, being surrendered to the influence of the ordinary chemical affinities, begin to separate; and the dissolution of the once living body speedily follows. It was, therefore, by the vital movement, that dissolution had been previously arrested, and that the elements of organized bodies were preserved in a state of temporary union. All bodies cease to live after a certain period of time, the duration of which is fixed for each species. Death appears to be a necessary effect of life; and the very exercise of the vital power gradually alters the structure of the body, so as to render its longer existence impossible. The frame undergoes a regular and continual change, as long as life remains. Its bulk first increases in certain proportions, and to certain limits, fixed for each species, and for the several organs of each individual; and then, in the course of time, many of its parts become more dense or solid. This last change appears to be the immediate cause of natural death.

If different living bodies be examined with attention, we shall find them to be composed of an organic structure, which is obviously essential to such a whirlpool, as that to which we have already compared the vital action. There must not only be solid particles to maintain the forms of their bodies, but fluids to communicate the motion. They are, therefore, composed of a tissue of network, or of solid fibres and thin plates (or laminæ), which contain the fluids in their interstices. It is among the fluid particles that the motion is most continuous and extensive. Foreign substances penetrate into the innermost parts of the body, and incorporate with it. They nourish the solids by interposing their particles; and, in detaching from the body its former parts, which have now become superfluous, traverse the pores of the living frame, and finally exhale under a liquid or gaseous form. During their course, the foreign substances enter into the composition of the solid framework, containing the fluids; and, by contracting, communicate a part of their motion to the liquid particles within them.

This mutual action of solids and liquids—this transition of particles from the one form to the other, presupposes a great chemical affinity in their elementary constituents; and we accordingly find, that the solid parts of organized bodies are composed chiefly of such elements as are capable of being readily converted into liquids or gases. The solids would also require to be endowed with considerable powers of bending and expanding, in order to facilitate the mutual action and reaction between the solids and the fluids; and hence, this is found to be a very general characteristic of the solid parts of organized bodies. This structure, common to all living bodies, —this porous or spongy texture, whose fibres or laminæ, ever varying in flexibility, intercept liquids, ever varying in quantity—constitutes what has been termed *organization;* and, from the definition we have already given of the term life, it necessarily follows that none but organized bodies are capable of enjoying life. Thus we see, that organization results from a great number of arrangements, all of which are essential conditions of life; and hence it follows, that if living bodies be endowed with the power of altering even one of these conditions, to such an extent as to obstruct or arrest any of the partial movements, composing the general action, they must possess within themselves the seeds of their own destruction.

Every organized body, besides the ordinary properties of its texture, possesses a form peculiar to its species; and this applies, not merely to its external arrangement in general, but even to the details of its internal structure. From this form is derived the particular direction of each of its partial movements; upon it depends the degree of intricacy in the general motion; and, in fact, it is this which constitutes the body a species, and makes it what it is.

Life is always attended by organization, just as the motion of a clock ever accompanies the clock itself; and this is true, whether we use the terms in a general signification, or in their application to each particular being. We never find life, except in beings completely organized and formed to enjoy it; and natural philosophers have never yet discovered matter, either in the act of organizing itself, or of being organized, by any external cause whatever. The elements forming, in succession, part of the body, and the particles attracted into its substance, are acted upon by LIFE, in direct opposition to the ordinary chemical affinities. It is impossible, therefore, to ascribe to the chemical affinities those phenomena, which are the result of the vital principle; and there are no other powers except those of life, capable of reuniting particles formerly separated.

The birth of organized beings is, therefore, the greatest mystery of organic arrangements, and indeed of all nature. We see organized bodies *develop* themselves, but they never *form* themselves; on the contrary, in all those cases where we have been able to trace them to their source, they are found to derive their origin from a being of similar form, but previously developed; that is, from a *parent*. The offspring is termed a *germ*, as long as it participates in the life of its parent, and before it has an independent existence of its own. In various species differences are found to exist in the place where the germ is attached to its parent; and also, in the occasional cause which detaches it, and gives it a separate existence; but, it is a rule which holds universally, without one single exception, that the progeny must have originally formed part of a being like itself. The separation of the germ is termed *generation*.

Many ancient, and some more recent philosophers, believed that certain organized beings could be produced without parents; and this opinion, though now completely exploded among the learned by the most convincing experiments, still maintains its ground with the ignorant. It originated, as most errors do, from hasty and inaccurate observation. Virgil gravely attempts, in a very elegant passage of the Georgics, to

> Explain
> The great discovery of the Arcadian swain;
> How art creates, and can at will restore
> Swarms from the slaughter'd bull's corrupted gore.

And Kircher, who lived in the seventeenth century, gives a recipe to make snakes, which, however, he does not appear to have tried.

In Scotland the country people still believe that the hair-worm (*Gordius aquaticus, Linn.*) can be formed artificially by placing a horse's hair in water; and this unfounded opinion is, we understand, generally diffused throughout the kingdom.

The mites in cheese, the blight on plants, and the maggots in meat, seem at first sight to favour the belief in spontaneous generation; but in all these cases the insects have been demonstrated to proceed from eggs, deposited instinctively by the parent, upon a substance capable of affording nutriment to her young. The popular mistakes on this subject are generally, however, concerning the lower tribes of animals. But the ancients taught that even man could be produced without a parent. The newly-formed earth was supposed to have been originally covered with a green down, like that on young birds; and, soon afterwards, men, like mushrooms, rose from the ground. Lucretius (A. C. 60) relates, that even in his time, when the earth was supposed to be too old for generation, "many animals were concreted out of mud by showers and sunshine."

Every organized being produces others resembling it. Without this provision, all species would become extinct, since death is the necessary consequence of the continued action of life. Certain animals possess the power of reproducing some of their parts, after these have been removed. This power is termed REPRODUCTION, and it is found in various degrees of perfection, according to the species.

In general, this power of renovating mutilated parts is found to exist most perfectly in the lower species of organized beings. The head of the snail (*Limax, Linn.*) may be cut off, and the whole organ, including its elegant telescopic eyes, will be reproduced. The claws, feet, and feelers (or *antennæ*) of crabs and lobsters, as well as the limbs of spiders, when amputated, are completely restored by the fresh growth of new organs. When accident deprives a shark of its teeth, they are replaced with facility. If the fins of fishes be cut, they will reunite, and the rays themselves will be reproduced, provided only the small parts at their bases are left. The eyes of lizards, though possessed of an intricate apparatus of coats and humours, if removed, will be replaced by new eyes equal to the former. Even man and the higher animals possess the same power, only restricted within narrower limits. Injuries to various parts of our frame are speedily repaired, and the wounds heal. The effect of injury to a living bone is curious. A new bone is produced round the old one; which finally dies, and is absorbed or discharged. The new bone, which at first was spongy in its texture, and irregularly formed, assumes, in a few years, its natural dimensions, and all appearance of change is completely removed. Thus we see the bountiful provision of Nature, and the effect of that principle of *reproduction*, which restores most of the organs of the body to their natural form and action, when deranged by injury or by disease.

Organized beings are developed with greater or less rapidity and perfection, according as they are placed in favourable or unfavourable circumstances. Heat, the quantity or quality of their nutriment, and other causes, exercise considerable influence over them; and this influence may extend over the whole frame, or be confined only to certain organs. Hence it follows, that the resemblance between the progeny and its parents can never be perfectly exact. These minor differences among organized beings are called *varieties*.

The different kinds of dog (*Canis familiaris, Linn.*), of horse (*Equus caballus, Linn.*), of sheep (*Ovis aries, Desm.*), are all varieties of the same species, and are produced by merely accidental causes, such as domestication, climate, &c. By cultivation, the sloe has been transformed into the plum, and the crab-tree into the apple-tree. The cauliflower and red cabbage, though apparently very different plants, are descended from the same parents,—the wild Brassica oleracea,—a weed growing near the sea. Mr. Herbert relates, in the Horticultural Transactions, that he succeeded in raising, from the natural seed of a highly-manured red cowslip, a primrose, a cowslip, oxlips of the usual and other colours, a black polyanthus, a hose-in-hose cowslip, and a natural primrose, bearing its flower on a polyanthus stalk;—all these are instances of varieties, depending upon soil and situation.

There is, however, no real ground for supposing that *all* the differences observable in organized beings are the result of accidental circumstances. Every thing hitherto advanced in favour of this opinion is purely conjectural. On the contrary, experience clearly shows, that, in the actual state of the globe, species vary only within very narrow limits; and, as far as past researches have extended, these limits are found to have been in ancient times the same as at present.

The French naturalists, who visited Egypt with Bonaparte, found the bodies of the crocodile, the ibis, the dog, the cat, the bull, and the ape, which had been embalmed three thousand years ago by the Egyptians as objects of veneration, to be perfectly identical with the living species now seen in that country, even to the minutest bones and the smallest portions of their skins. The common wheat, the fruits, seeds, and other parts of twenty different species of plants, were also discovered, some of them from closed vessels in the sepulchres of the kings; and they resembled in every respect the plants now growing in the East. The human mummies, also, exactly corresponded with the men of the present day.

We are, therefore, compelled to admit that certain forms have been regularly transmitted to us from the first origin of things, without having transgressed the limits assigned to them [except in a slight degree, when modified by certain accidental circumstances]. All beings, derived from the same original form, are said to constitute a *species;* and the *varieties* are, as has been stated, the accidental subdivisions of species.

Generation appears to be the only means of ascertaining the limits by which varie-

ıre circumscribed; and we may therefore define a SPECIES to be—a group or
ıblage of individuals, descended one from another, or from common parents, or
others resembling them as much as they resemble each other. However rigor-
ıis definition may appear, its application in practice to particular individuals is
ved in many difficulties, especially when we are unable to make the necessary
iments.

conclusion, we shall repeat, that all living bodies are endowed with the functions
sorption [by which they draw in foreign substances]; of assimilation [by which
convert them into organized matter]; of exhalation [by which they surrender
superfluous materials]; of development [by which their parts increase in size
ensity]; and of generation [by which they continue the form of their species].
and death are universal limits to their existence: the essential character of
structure consists in a cellular tissue or network, capable of contracting; con-
ıg in its meshes fluids or gases, ever in motion: and the bases of their chemical
ısition are substances, easily convertible into liquids or gases; or, into proximate
ples, having great affinity for each other. Fixed forms, transmitted by genera-
distinguish their species, determine the arrangement of the secondary functions
ıed to each, and point out the part they are destined to perform on the great
of the universe. These organized forms can neither produce themselves, nor
e their characters. Life is never found separated from organization; and, when-
the vital spark bursts into a flame, its progress is attended by a beautifully
ized body. The impenetrable mystery of the pre-existence of germs alike
observations the most delicate, and meditations the most profound.

race an individual to its parents, and these again to their parents. After a few generations
e is lost, and in vain we inquire, Whence arose the first animal of the species? and what
ed the first germs from which have descended the innumerable tribes of animals and plants
e see in constant succession rising around us? Whence did the species MAN arise? Philoso-
inquiry fails to lead us through the labyrinth; and we feel the force of the same principle
inspired Adam, when he says, with Milton,

> "Thou sun, fair light,
> And thou enlightened earth, so fresh and gay,
> Ye hills and dales, ye rivers, woods, and plains,
> And ye that live and move, fair creatures, tell,
> Tell if you saw, how came I thus, how here,
> Not of myself?"

SECT. III.—DIVISION OF ORGANIZED BEINGS INTO ANIMALS AND PLANTS.

ls and Plants—Irritability—Animals possess Intestinal Canals—Circulating System—their Chemical Composition—Respiration.

G or organized beings have been subdivided by universal consent, from the
st ages, into ANIMALS endowed with sensation and motion, and into PLANTS
ute of both, and reduced to the simple powers of vegetation.

ne plants retract their leaves when touched; and all direct their roots towards
ure, and their flowers or leaves towards air and light. Certain parts of plants
exhibit vibrations, unassignable to any external cause. Yet, these different move-
, when attentively examined, are found to possess too little resemblance to the
ns of animals, to authorize us in considering them as proofs of perception and
ition.

seem to proceed from a power, possessed in general by all living substances, of contracting
panding when stimulated,—a power to which the name of *irritability* has been assigned.
res composing the heart of animals alternately expand and contract, altogether independent
will of the animal; and thick hair will grow on the skins of some animals, when removed
cold climate. As we neither ascribe volition nor sensation to the heart or to the hair, so we
attribute these qualities to the heliotrope, to the sun-flower, or to the sensitive plant. The

nice distinction of character must be cautiously observed, between sensation and mere irritability: like the higher powers of reason and instinct, they are

> "For ever separate, yet for ever near."

The power of voluntary motion in animals necessarily requires corresponding adaptations, even in those organs simply vegetative. Animals cannot, like plants, derive nourishment from the earth by roots; and hence they must contain within themselves a supply of aliment, and carry the reservoir with them. From this circumstance is derived the first trait in the character of animals. They must possess an intestinal canal, from which the nutritive fluid may penetrate, by a species of internal roots, through pores and vessels into all parts of the body. The organization of this cavity, and of the parts connected with it, ought to vary according to the nature of the aliments, and the transformations necessary to supply the juices proper to be absorbed; whilst the atmosphere and the earth have only to present to vegetables the juices already prepared, when they are immediately absorbed.

Animal bodies, having thus to perform more numerous and varied functions than plants, ought to possess a much more complicated organization; and, in consequence of their several parts having the power of changing their position relatively to each other, it becomes necessary that the motion of the fluids should be produced by internal causes, and not be altogether dependent on the external influences of heat and of the atmosphere. This is the reason that animals are endowed with *a circulating system*, or organs for circulating their fluids, being the second characteristic peculiar to animals. It is not so essential, however, as the digestive system, for it is not found in the more simple species.

The complicated functions of animals require organized systems, which would be superfluous in vegetables; such as, the muscular system for voluntary motion, and the nerves for sensation. It was also necessary that the fluids should be more numerous and varied in animals, and possessed of a more complicated chemical composition than in plants, in order to facilitate the action of these two systematic arrangements. Therefore, another essential element was introduced into the composition of animals, of which plants, excepting some few tribes, are generally deprived; and while plants usually contain only three elements, oxygen, hydrogen, and carbon, animals add to these a fourth, namely, azote or nitrogen. This difference in chemical composition forms the third trait in the character of animals.

Plants derive their nourishment from the soil and atmosphere, and thence obtain water, composed of oxygen and hydrogen; also, carbonic acid, which is a compound of carbon and oxygen; while the atmosphere yields an unlimited supply of air, composed of oxygen and nitrogen [with a slight mixture of carbonic acid]. From these materials, the supplies necessary to preserve their own composition unaltered are obtained; and, while hydrogen and carbon [with a certain portion of oxygen] are retained, they exhale the superfluous oxygen [untainted]. The nitrogen, on the contrary, is [either absorbed in very small quantities, or] altogether rejected. Such is the theory of vegetable composition; in which one of the most essential parts of the process, namely, the exhalation of oxygen, can only be performed by the assistance of light.

When plants are deprived of light, an opposite effect ensues. Instead of giving off oxygen gas, and absorbing carbonic acid, the reverse takes place; and carbonic acid is disengaged, while oxygen is absorbed. The effect of plants upon the air is, therefore, to increase its purity during day-light, but to deteriorate its quality during the darkness of night.

Animals require for their nutriment, directly or indirectly, the same substances which enter into the composition of vegetables, namely, hydrogen, carbon [and a certain portion of oxygen]. But, in addition to these, it is essential, for the preservation of their peculiar constitution, that they accumulate a much larger portion of nitrogen, and disengage any excess of hydrogen, and especially any superfluity of carbon. This is performed by RESPIRATION, or breathing, in which process the oxygen contained in the atmosphere combines with the [excess of] hydrogen and carbon in the blood; with the former of these, it forms watery vapour, and with the latter carbonic acid. The nitrogen, to whatever part of the system it may penetrate, seems chiefly, though not altogether, to remain there.

The quantity of nitrogen retained in the system varies with the seasons, being greater in summer, and less in winter. The degree of variation is different for animals of different species: in some it is very small in quantity, while in others it is equal to their entire bulk.

The effects produced upon the atmosphere by plants and animals, are of an opposite kind; the former decompose water and carbonic acid, while the latter reproduce them. Respiration forms the fourth characteristic of animals, and is the most distinguishing function of the animal frame; namely, that which forms its essential difference from all other beings, and in a manner constitutes it an animal. So important is its influence over the whole body, that we shall presently be able to show, that animals perform the functions of their nature with greater or less perfection, according as their respiration is more or less perfect.

Thus we perceive that animals are distinguished from plants by the following characteristics:—1st, They are possessed of an intestinal canal; 2dly, Of a circulating system; 3dly, Nitrogen enters largely into their composition; and finally, They are endowed with organs adapted for respiration.

SECT. IV.—THE ORGANIC FORMS OF THE ANIMAL BODY, AND THE PRINCIPAL CHEMICAL ELEMENTS OF ITS COMPOSITION.

Cellular Tissue—Membranes—Gelatine—Medullary Substance—Muscular Fibre—Fibrin—Blood—Albumen—Secretion—Nutrition.

A porous tissue of network, and at least three chemical elements (carbon, hydrogen, and oxygen), are essential to all living bodies, while a fourth element (nitrogen) may be almost considered peculiar to animals. We shall now proceed to describe the various kinds of meshes, of which the network is composed, and the different combinations into which these four elements are found to enter.

There are three kinds of organized principles, or forms of network; the *cellular tissue*, the *medullary substance*, or marrow, and the *muscular fibre*. To each of these forms is attached a peculiar combination of chemical elements, as well as a particular function.

The *cellular substance* is composed of an indefinite number of small laminæ, without any apparent arrangement, crossing so as to form very small cells, communicating with each other. It may be compared to a species of sponge, similar in form to the entire body; while all other animal particles either occupy its cells, or traverse its substance. It possesses the property of contracting indefinitely when the causes, which preserved it in a state of extension, are removed. This power retains the body within the limits, and in the form, assigned to it by Nature.

The cellular substance, or tissue, enters into the composition of every part, forming regular series of cells. We find it equally in the brain, the eye, and the nerves, only somewhat finer in its texture than in the bones and muscles. Its cells move with facility, and accommodate themselves to the motions of the body, being moistened, at the points of contact with the adjacent cells, by a liquid, which lubricates them like the synovia or oily fluid of joints, so as to facilitate their motion.

When the cellular substance is compressed into compact plates, it forms laminæ of various extent, called *membranes*. These membranes, when united into cylindrical tubes, more or less ramified, receive the name of *vessels*. The filiments, called *fibres*, are entirely composed of cellular substance; and the bones are nothing more than cellular substance, rendered hard by the deposition of earthy particles.

The general matter of which the cellular substance is composed, consists in the proximate principle or combination, called *gelatine;* the distinguishing character of which is, that it can be dissolved by boiling water, and, upon cooling, takes the form of a tremulous jelly.

Gelatine, when analyzed by Gay-Lussac and Thenard, was found to contain in 100 parts, by weight—carbon, 48; hydrogen, 8; oxygen, 27; and nitrogen, 17; very nearly.

The *medullary substance* cannot be resolved into any simpler organic structure. It appears to the eye as a soft whitish pulpy matter, composed of an infinite number of very minute globules. No peculiar motions can be observed in it; but it possesses that most wonderful of all properties, the power of transmitting to the mind the impressions made on the external organs of sense, and of rendering the muscles subservient to the determinations of the will. The brain and spinal marrow are almost entirely composed of medullary substance; and the nerves, which are distributed through all the organs capable of sensation, are, in respect to their composition, nothing but bundles (or fasciculi) of this substance.

The *muscular*, or fleshy *fibre*, is composed of a particular kind of filaments, having the peculiar property, during life, of contracting or folding themselves up, when touched or injured by any external body; or when acted upon, through the medium of the nerves, by the will.

The muscles are the immediate organs of voluntary motion, and are composed entirely of bundles of fleshy fibres. All the membranes and vessels, which are required to exercise any compressive force, are armed with these fibres. They are always united intimately with the nervous filaments, or threads; but certain muscles are observed to execute motions altogether independent of the will, especially in the exercise of functions possessed in common with plants. Thus, although the will is frequently the cause of muscular motion, yet its power is neither general nor uniform in its action.

Fleshy fibre has, for the basis of its composition, a particular principle, named *fibrin*, which is [nearly] insoluble in boiling water, and seems naturally to assume a filamentous arrangement.

It consists of white solid fibres, inodorous and insipid. When analyzed by Gay-Lussac and Thenard, 100 parts were found to contain about 53 parts of carbon, 7 of hydrogen, 20 of oxygen, and 20 of nitrogen.

The nutritive fluid, or blood, when recently extracted from the circulating vessels, may not only be ultimately resolved, for the most part, into the general elements of the animal body, carbon, hydrogen, oxygen, and nitrogen; but it already contains fibrin and gelatine, prepared to contract their substance, and to assume respectively the forms of filaments or of membranes, according to circumstances, whenever a slight repose enables them to exhibit this tendency. In addition to these, the blood contains another proximate principle, called *albumen* [composed very nearly of 53 parts of carbon, 7 of hydrogen, 24 of oxygen, and 16 of nitrogen]. Its character is to coagulate in boiling water [like the white of eggs, composed almost entirely of albumen]. We also find in the blood nearly all the other elements which enter into the composition of each animal body in small quantities; such as, the lime and phosphorus deposited in the bones of the higher animals; the iron, which seems essential to the colour of the blood and other parts; and the fat, or animal oil, placed in the cellular tissue to render it flexible. In fact, all the solids and fluids of the animal body are composed of chemical elements contained in the blood. It is only by possessing some elements, of which the others are deprived, or by a difference in the proportions in which they combine, that [in general] they can be distinguished. From this it appears that it only requires, for their formation in the body, to abstract the entire, or a part, of one or more elements of the blood; or, in a few cases, to add a foreign element, procured from another source.

Some substances, differing very much in character, seem, however, to possess nearly the same chemical composition; we must therefore consider the peculiar arrangement of the particles as an essential distinction among animal fluids and solids, as well as their composition, and the proportions of their elements.

We might, without impropriety, assign the term *secretion* to denote the various operations by which the blood nourishes and renovates the solid and fluid parts of the body. But we shall restrict the term to the production of *fluids* only; while we shall apply the term *nutrition* to signify the production and deposition of the materials necessary for the growth and maintenance of the *solids*. To each solid organ, and to every fluid, is assigned that peculiar composition which is suited to its place in the system; and, by the renovating power of the blood, their composition is preserved during health, and the continual waste repaired. Thus, by affording continual supplies of nutriment, the blood would undergo a perpetual deterioration, were it not restored by the new matter obtained from the digestion of the food; by respiration, which relieves it of the superfluous carbon and hydrogen; by perspiration, and various other means, which deprive it of any excess of other principles.

These continual changes in the chemical composition of the several parts are as essential to the vital action, as the visible motions of the old particles, and the constant influx of new ones: indeed, they seem to be the final object for which the latter motions were designed.

SECT. V.—ACTIVE FORCES OF THE ANIMAL BODY.

Muscular Fibre—Nerves—Hypothesis of a Nervous Fluid.

THE muscular fibre is not confined, in its functions, to be merely the organ of voluntary motion. We have shown, that it is one of the most powerful agents employed by Nature, in effecting such necessary motions and transference of particles in the bodies of animals as are possessed by them in common with vegetables. Thus, the muscular fibres of the intestines produce the peristaltic motion, which renders these canals pervious to the aliment; and the muscular fibres of the heart, with the arteries, are the agents in the circulation of the blood; and thus, ultimately, of all the secretions.

The will contracts certain portions of the muscular fibre through the medium of the nerves. Certain other fibres, such as those to which we have just alluded, are independent of the will, and yet are animated by nerves extending through them. We may therefore conclude, from analogy, that these nerves are the causes of their involuntary contraction.

The nerves are composed of several distinct filaments, resembling each other in every respect; and they appear to be formed of the same soft pulpy material, commonly called marrow, or medullary substance, surrounded by a cellular membrane. The filaments are again enveloped in a tube of this membrane, forming a continued nerve, extending from the brain to various parts of the muscles and skin. Yet the functions of the several filaments of the same nerve are very different. One filament is designed for voluntary muscular motion, another for sensation, and a third for involuntary motion. Sir Charles Bell, to whom we owe this remarkable discovery, divides all the nervous filaments of the body into four general systems; namely, of voluntary motion, of sensation, of respiration, and of involuntary motion. The last of these performs the functions of nutrition, growth, and ultimately of decay. Besides these, there are nerves destined to particular functions of sensation; such as sight, smell, and hearing.

When the sensitive filament of a nerve is injured in any part of its course, pain and not motion is the result; and the pain is referred by the animal to that part of the skin where the remote extremity of the filament is distributed into minute fibres. A patient, whose leg has been amputated, will feel a pain, which long-continued habit has taught him to refer to the extremity of the toes; when, in reality, the injury has been inflicted upon that portion of the nervous filament which terminates at the stump.

In the remainder of this section, our author proposes to explain the phenomena of the nerves upon the hypothesis of a *nervous fluid*, acted upon by certain chemical affinities. We are aware that several, almost insurmountable, objections may be urged against this theory, and indeed against every other which attempts to explain the complicated functions of life. Yet, if an hypothesis correspond pretty accurately with observed facts, it may have its uses, by fixing the phenomena in the memory, provided we always recollect, that it is but an hypothesis, to be modified as knowledge extends. Thus the phenomena of heat are referred to the imponderable fluid *caloric;* of light, to the vibrations of a highly elastic medium; of eletricity, to the electric fluid;—none of which can be demonstrated to have a real existence in nature. But, in adopting an hypothesis, we must never forget that it is a temporary, not a final, theory—a motive for seeking further analogies, or, as Dr. Thomas Brown rightly observes, "a reason for making one experiment rather than another."

HYPOTHESIS OF A NERVOUS FLUID.

Every contraction, and, in general, every change in the dimensions of inorganic matter, is occasioned by a change of chemical composition; either by the absolute addition or abstraction of some solid matter, or by the flux or reflux of an imponderable fluid, such as caloric. In this way the most violent convulsions of nature arise, such as explosions, conflagrations, &c.

It is therefore probable that the nerve acts similarly upon the muscular fibre, by means of an imponderable fluid, especially as it has been proved that the impulse is not mechanical.

The medullary matter of the entire nervous system is formed throughout of the same material; and, blood-vessels accompanying all its ramifications, it is thus enabled to exercise, in every part, the functions belonging to its nature.

All the animal fluids being secreted from the blood, there is every reason to infer that the nervous fluid is derived from a similar source, and that the medullary substance is the agent in the secretion. On the other hand, it is certain that the medullary substance is the sole conductor of the nervous fluid; all the other organic elements are non-conductors, and arrest it, as glass opposes the progress of the electric fluid.

All the external causes, capable of producing sensation, or of occasioning contractions in the muscular fibre, are chemical agents, possessing a power of decomposing, such as light, caloric, salts, odorous vapours, &c. It is therefore extremely probable, that these causes act in a chemical manner upon the nervous fluid, by altering its composition; and this view appears to be confirmed by the fact, that the action of the nerves is enfeebled by long continuance, as if the nervous fluid required a supply of new materials to restore its composition, and enable it to undergo a further alteration.

An external organ of sense may be compared to a kind of sieve, which only permits those agents to pass through it, and act upon the nerve, that it is fitted to receive at that place; but it often accumulates the nervous fluid so as greatly to increase its effect. Thus, the tongue has spongy papillæ, which imbibe saline solutions; the ear is furnished with a gelatinous pulp, violently agitated by the sonorous vibrations of the air; and the eye is supplied with transparent lenses, which concentrate the rays of light.

Those substances which have obtained the name of *irritants*, from their power of occasioning contractions in the muscular fibre, probably exercise this action through the medium of the nerves; and they influence them in the same manner as the will does, that is, by affecting the nervous fluid, in the manner necessary to alter the dimensions of the muscular fibre under its influence. Yet the will is not concerned in producing these effects; often the mind is totally unconscious of their action. Even when the muscles are separated from the body, they are susceptible of being irritated, so long as that portion of the nerve which accompanies them retains its power of acting. In this case, the phenomena are totally removed from the influence of the will. The state of the nervous fluid is altered by muscular irritation, as well as by sensation and voluntary motion: there exists, therefore, the same necessity for restoring its original composition. Irritants occasion those movements and transferences of particles necessary to the functions possessed in common by animals and plants; thus, the aliment stimulates the intestine; the blood irritates the heart. These motions are all performed independent of the influence of the will, and, in general, while health continues, without the consciousness of the animal. To effect these objects, the nerves which produce the motion have, in most cases, an arrangement entirely different from those affected by sensation or controlled by the will.

The nervous functions, by which we mean sensation and muscular irritability, are exercised with more or less vigour upon every point, in proportion as the nervous fluid is more or less abundant there; and as this fluid is produced by secretion, its quantity ought to depend jointly upon the quantity of the medullary matter secreting it, and upon the supplies of blood received by this medullary substance. In animals possessing a circulating system, the blood is distributed to all parts of the body,

h the arteries, by means of their irritability and the action of the heart. If
rteries be irritated in an unusual degree, they act more forcibly and propel a
quantity of blood; the nervous fluid becoming more abundant, increases the
ensibility; and, reacting upon the irritability of the arteries, carries their
action to a high degree. This is called nervous excitement, or *orgasm;* when
nes painful and permanent, it is termed *inflammation.*

mutual influence of the nerves and muscular fibres, whether in the intestinal
rial systems, is the true source of those involuntary actions, common both to
and animals.

internal organ is susceptible of irritation only from its peculiar irritant, to
it is in a manner especially adapted, just as an external sense can be affected
its particular objects. Thus mercury irritates the salivary glands, and can-
s the *vesica.* These agents have been called *specifics.*

he nervous system is continuous and of uniform structure, local irritations, and
tly repeated sensations, fatigue it throughout the whole extent; so that any
n, when excessively exercised, may enfeeble all the others. Thus, too much
pedes the action of the intellectual powers, and long protracted study impairs
vers of digestion.

xcessive local irritation may affect the whole body, just as if all the vital
s were concentrated upon one single point. But a second irritation, in an-
lace, will diminish the first, or, as it has been called, *determine* the first into
part; such is the effect of blisters, laxatives, and other counter-irritants.

ave thus shown, in the above brief sketch, that it is possible to account for
phenomena of physical life; if we merely assume hypothetically the existence
rvous fluid, possessed of certain properties, which are deduced from generaliz-
phenomena of the vital system.

I.—THE ORGANS OF ANIMAL BODIES, THEIR APPROPRIATE FUNCTIONS, WITH THEIR VARIOUS DEGREES OF COMPLICATION.

—Touch—Taste—Smell—Sight—Hearing—Muscular Sense—Head—Brain—Voluntary
—Muscles—Bones—Tendons—Ligaments—Nutrition—Stomach—Gastric Juice—Chyme
le—Lacteals—Arteries—Veins—Lymphatics—Respiration—Lungs—Gills—Tracheæ—
ry Vessels—Secretory Glands—Generation.

having considered the organic elements of the animal body, the chemical ele-
f its composition, and the active forces which prevail in it, nothing now
to complete a general view of the animal system, excepting a summary
of the several functions of which life is composed, with a description of their
iate organs.

functions of the animal body may be divided into two classes—the animal
s, which are peculiar to animals—and the vital or vegetative functions, com-
animals and plants. The former comprise sensation and voluntary motion,
er nutrition and generation.

hall commence with SENSATION, which resides in the nervous system.

ense of touch is the most extensively diffused of all the external senses. It
d in the skin, a membrane enveloping the entire body, and traversed in every
nerves. Their extreme fibres are expanded at the surface of the skin into
papillæ, or small projecting filaments, where they are protected by the outer
d by other insensible coverings, such as hair or scales.

gree of perfection in which different animals possess this sense varies considerably; but
ise, in a high degree, is always accompanied by certain conditions. The organ must be
with numerous nerves and papillæ, under a very fine cuticle; with a soft cellular sub-
ke a cushion: and with a hard resisting base. It must also be endowed with a consider-
ee of flexibility, as a close contact with the surfaces of bodies is indispensable. Most

animals are possessed of some particular organ, in which the sense of touch is developed in a high degree. In the hand of man, and particularly at the extremities of the fingers, we find all the necessary requisites of this sense, combined in their most perfect form. The proboscis, or trunk, of the elephant seems to rank next to the human hand; and, among the higher orders of animals, either the snout or the lip is endowed with much sensibility. This quality is particularly observable in the nose of the tapir and of the hog, in the lips of the mole, and in the upper lip of the rhinoceros. The seal, and animals of the cat kind, such as the lion and tiger, have whiskers, possessed, near their roots, of considerable delicacy, which renders them of important use to these animals as feelers. Certain species of monkeys have delicate prehensile tails, which they use with surprising agility. In birds, the nerves of touch seem chiefly developed in the feet and toes, and most of the aquatic species are endowed with bills of considerable feeling. Serpents use their slender tongues as instruments of touch; and the great flexibility of their bodies renders them well adapted for the exercise of this sense. The snouts of fishes have some nicety; but, with this exception, these animals seem nearly destitute of delicate sensation. Insects feel chiefly by means of their antennæ; and the several tribes of annelida, actiniæ, and polypi, by their tentacula. Several animals are covered with a dense integument in many of their parts, which are thus wholly unfitted for this sense. The thick hides of the elephant and rhinoceros, the feathers of birds, the scales, horny coverings, and shells of the lower animals, are evidently inconsistent with the necessary conditions of touch. Bats are enabled to fly in the darkest places, by the extreme acuteness of their tactual nerves.

Taste and smell are merely more delicate modifications of this sense, for the exercise of which the membranes of the tongue and nostrils are specially organized.

In most of the lower animals the sense of taste is very imperfect, or it is altogether wanting. The tongue of man is supplied with numerous papillæ, of a conical form and spongy texture, projecting in a manner visible even to the naked eye. Taste seems in him to attain its most perfect state; and he not only enjoys the natural varieties of an omnivorous animal, but also a number of acquired tastes, which other species are wholly denied. The tongues of birds, of reptiles, and of fishes, are often covered with a hard and horny cuticle, which renders them altogether unfit for the delicate exercise of the sense. Many animals swallow their food without mastication; and they must be thereby effectually deprived of the enjoyments of taste, as a certain degree of contact between the food and the organ is essentially necessary for its exercise.

The sense of smell resides in an organ rendered susceptible by the extreme delicacy and extent of its ever humid surface.

Very minute particles of an odoriferous substance are darted forth in every direction, and are received upon the extensive and complex membrane, which lines the internal parts of the nasal cavity. Matter is thus perceived, when in a state of great subdivision, with a degree of acuteness far surpassing any of the other senses. The extreme minuteness of these particles may be inferred from the fact, that musk, and many other substances, will exhale odour for several years, and yet no loss in their weight can be detected, even by the most delicate balances. Carnivorous animals, in general, possess a more acute sense of smell than those living upon vegetable food; and the structure of their nasal cavities is consequently much more intricate. This power was obviously given to facilitate the discovery of their food. In man the sense of smell seems best adapted for vegetable effluvia. A dog, though surpassing him in detecting the most minute effluvium of another animal, will derive no pleasure from the finest vegetable odours. M. Audubon is of opinion that birds of prey are not endowed with an acute sense of smell. The degree in which this sense is enjoyed by the lower tribes of animals has not yet been completely determined, but it is observed to exist in bees and snails.

The beauty of the eye, and the unbounded sphere which it exposes to observation, give to the sense of sight a decided pre-eminence. Light, when emitted from the sun or any luminous body, strikes upon the external covering of the eyeball. By means of the crystalline lens, it is then refracted or bent from its original direction to a focal point, from which the rays of light are again distributed on the expanded extremity of the optic nerve, prepared to receive them. The size of the eyes in quadrupeds, and the intensity of their vision, bear a constant relation to the nature of their food. Herbivorous animals, such as the elephant and the rhinoceros, have very small eyes in comparison with their entire bulk. The eyes of the whale, when viewed singly, are very large; but they seem disproportionately small, if we contrast them with the enormous mass of the entire body. But quadrupeds and birds feeding on flesh, require powers of vision of very great intensity. In these animals we accordingly find the organ large, and highly developed, so as commonly to impart a peculiar expression of forocity to their countenances. The animals which are the objects of pursuit are frequently supplied with acute vision, thereby enabling them to escape or avoid danger; and this is particularly exemplified in the squirrel, the rat, the deer, and the hare. Animals which burrow under ground, as the mole and the shrew-mouse, have, in general, exceedingly small eyes; while in some they have been found nearly wanting, as in the blind rat (*Mus typhlus, Linn.*). The cat, the lemur, and other animals which pursue their prey during the night, are peculiarly adapted, by the construction of their eyes, for acutely perceiving objects, when illuminated by a very small quantity of light. The eyes of reptiles and fish are accommodated to the medium in which they reside. The chameleon can move one eye with rapidity, and in various directions, while the other remains fixed. Reptiles residing generally in the water, also fish, and the cetacea, such as the dolphin and seal, have their eyes covered with a dense skin, and the lens is more convex than in other animals. The arachnides, or spiders, possess generally eight eyes, arranged upon the upper part of the head in a symmetrical form; and there are not less than twenty-eight in the common millepede (*Julus terrestris*). The insect tribes enjoy great variety and intensity in their visual organs; but the precise limits of this sense among the lowest animals in the scale of creation is not yet clearly ascertained.

The organ of hearing is excited by vibrations or undulations of air, of water, or of some solid medium, recurring at intervals, with different degrees of frequency. These impulses are received upon the tympanum or ear-drum; thence they are communicated to the acoustic nerve, and are finally transmitted to the brain. When the vibrations are not performed in equal times, or do not occur more frequently than seven or eight in a second, there is heard merely a *noise*. But when they rise much above this velocity, a very low or grave musical note is first heard. By an increase of velocity, the note becomes higher or more acute, and the ear is finally capable of perceiving sounds resulting from 31,000 impulses in a second. There is a regular gradation among animals in the perfection of the organ of hearing, but none of them can rival the delicacy with which the practised ear in man perceives minute changes of tone, alterations in the quality or expression of sound, and varieties in its intensity and loudness. Feeble and timid quadrupeds generally have their ears directed backwards, to warn them of approaching danger; while, in the predaceous tribes, the ears are placed forwards, to aid in discovering their prey. Animals, though seldom susceptible of musical notes, sometimes exhibit an aversion for the low or grave sounds. This is remarkably the case with the lion. In bats, the sense of hearing is surprisingly acute.

L'organe de la génération est doué d'un sixième sens, qui est dans sa peau intérieure.

Perhaps a greater claim to the right of being termed the *sixth* sense may be established in favour of that feeling of resistance, or *muscular* sense, by which we perceive the degree of force exercised by particular muscles. The mouth and lips of a new-born animal are directed by this sense to their proper function; and the adult would be in danger of a fall while engaged in walking, leaping, or other active exercises, if he were for a moment unconscious of the present state of the muscles appropriated to those actions. Shooting, bounding, and taking aim, presuppose a consciousness of the degree of muscular exertion sufficient to produce a certain effect; and instances are not wanting of its surprising accuracy. Thus, the Indian fresh-water fish called the *Chætodon rostratus*, will hit an insect with a small drop of water at a distance of several feet, and the encumbered insect speedily falls an easy prey. When the elephant is annoyed by flies, he will discharge a large quantity of water upon the part attacked, with sufficient accuracy and force to dislodge them. The deadly spring of the lion and tiger exhibits the instantaneous result of the muscular sense in its most tremendous form. Dr. Yellowley mentions the case of a woman who was afflicted with the disease called *anæsthesia*, where the muscular sense of her hands was lost, although the muscular power remained. On turning her eyes aside, she used to drop glasses, plates, &c., which were held in safety as long as another sense supplied the place of the lost one.

The stomach and intestines are possessed of certain peculiar sensations which declare the state of these viscera; and indeed every part of the body is susceptible of sensations, more or less painful, when affected by accident or disease.

Pain teaches an animal to avoid hurtful objects, and is wisely given as a safeguard to his frame; accordingly, its seat is mostly at the surface. The deep parts of the body have but little sensation, as it would there be only a useless encumbrance. The animal is continually warned, by uneasy sensations, to change his posture frequently, to avoid high degrees of heat, and in general to accommodate his frame to surrounding circumstances.

Many animals are defective both as to ears and nostrils, several are destitute of eyes, and some are reduced solely to the sense of touch, which is never wanting.

In the higher animals, impressions made upon the external organs of sense are transmitted by the nerves to the brain and spinal marrow, which form the central masses of the nervous system. The elevation of an animal in the scale of creation may [frequently] be determined by the volume of its brain, and the degree in which the power of sensation is concentrated there. Animals of a lower grade have the medullary masses much dispersed; and in the more simple genera, all trace of nerves seems to be lost in the general substance of the body. That part which contains the brain and principal organs of sense is called the *head*.

We now proceed to consider the second animal function—namely VOLUNTARY MOTION.

When the animal wills to move, in consequence of a sensation upon an external organ, or any other cause, the motion is transmitted to the muscles by means of the nerves.

This power of originating motion, residing in the nervous system of living animals, is one of the most wonderful properties of their nature. Every machine, however complicated or varied in its structure, can only be set in motion by some external power already existing in nature, or produced by art, whether it be the expansive force of steam, the descent of weights, the action of running water, or the recoil of a spring. No perpetual motion can ever be preserved by any arrangement of the parts of a machine among themselves; they must rest ultimately upon a prime mover. But the exquisite arrangement of the animal frame surpasses, in this respect, the highest mechanical skill. The mind wills—the muscle contracts. How much soever we may desire to unravel the mystery, the process is inexplicable, and seems for ever removed beyond the reach of human ingenuity. The only fact hitherto ascertained is, that if the nerve be separated, seriously injured, or even tightly compressed, the motion of the muscle will not follow the volition of the mind.

The muscles are bundles of fleshy fibres, by the contraction of which the animal body performs all its motions. The extension and lengthening of the limbs are equally the result of muscular contraction with their bending and drawing in. They are arranged in number and in direction to suit the motions which each animal is destined to perform; and when it becomes necessary to execute these motions with vigour, the muscles are inserted upon hard parts, which are so articulated, one over the other, as to constitute them so many levers. These parts, in the vertebrated animals, are called bones. They are situate internally, and are formed of a gelatinous mass [of cellular substance, the pores of which are] penetrated by particles of phosphate of lime. In some of the lower tribes of animals, such as the Mollusca, the Crustacea, and the Insects, these hard parts are external, and composed either of calcareous or of horny substances, called shells, crusts, or scales, all of which are secreted between the skin, and the epidermis or cuticle.

A considerable difference is found between the chemical composition of the bones belonging to the higher orders of animals and the external coverings of crustaceous animals. Human bones, when analyzed by Berzelius, were found to contain in 100 parts nearly as follows: of animal matters (being chiefly gelatine, cartilage, and marrow), 34 parts; of phosphate of lime, 51 parts; of carbonate of lime, 11 parts; of fluate of lime, 2 parts; of phosphate of magnesia, 1 part; and of soda, muriate of soda and water, 1 part. Here the principal ingredient is *phosphate* of lime; but in the hard parts of crustaceous animals, such as crabs and lobsters, the *carbonate* of lime is considerably in excess. The shells of the mollusca, such as muscles and oysters, are almost entirely formed of the carbonate of lime. On the contrary, the horny coverings of insects contain a very minute portion of earthy matter, and are mostly composed of animal substances. The same proximate elements enter into the composition of horns, nails, and hoofs, being gelatine, with a membranous substance, resembling the white of eggs boiled hard. The scales of fish are composed of layers of membrane alternately with those of phosphate of lime, which arrangement is the cause of their brilliancy; but the scales of serpents contain no phosphate of lime, and very much resemble, in their constitution, the horny coverings of insects.

The fleshy fibres are inserted upon the hard parts, by means of other fibres of a gelatinous nature, called *tendons*, which seem to be a continuation of the first.

These tendons exercise the same office as straps or ropes in ordinary machinery, when it is required to transfer motion from one part to another. By this means a moving power can be exercised, in a spot where its immediate presence would be highly inconvenient. Thus, the hand is moved by tendons communicating with muscles, fixed at a considerable distance upon the arm; and the velocity and delicacy of its movements are not obstructed by their presence. Often these tendons are strapped down by cross cords, and pass along grooves in the bones, or through a pulley formed by a ligament. By these mechanical contrivances, the direction in which the muscular power acts may be changed; the forces of different muscles are compounded, and altered in intensity; and the velocity of the resulting motions modified according as circumstances may require. This arrangement also permits the accumulation of force upon one point; for a great number of muscular fibres are employed to contract one tendon, in the same manner several horses may be employed to draw the same rope.

The peculiar shape observable in the articulated surfaces of the hard parts confine the motions of the tendons within certain limits, and they are still further restrained by cords or envelops, usually called *ligaments*, attached to the sides of the articulations. Animals become enabled to execute the innumerable motions involved in the exercise of walking or leaping, flying or swimming, according as the bony and muscular appendages are adapted for these various motions; and also, according to the relative forms and proportions which the limbs, in consequence, bear among themselves.

Nutrition, which we shall now explain, forms the first of the vegetative functions.

The muscular fibres connected with digestion and circulation are not influenced by the will, but, on the contrary, as we have already explained, their principal arrangements and subdivisions appear to be specially intended to render the animal completely unconscious of their exercise. It is only when the mind is disturbed by violent passions, or paroxysms, that its influence is extended beyond the ordinary limits, and that it agitates these functions common to vegetable life. Sometimes, when the organs are diseased, their exercise is accompanied by sensation; but, in ordinary cases, digestion and circulation are performed without the consciousness of the animal.

The aliment is first masticated, that is, minutely divided by the jaws and teeth, or sucked in, when taken by the animal in a liquid form. It is then swallowed entirely by the muscular action of the back parts of the mouth and throat, and deposited in the first portions of the alimentary canal, which are usually expanded into one or more stomachs, where the food is penetrated and dissolved by corrosive juices.

This gastric juice possesses the very remarkable property of dissolving most animal and vegetable matters, when deprived of life, and some mineral substances. It more especially acts upon such as yield nutriment to the animal, and are adapted to its general habits and formation. When recently procured from the stomach of a healthy animal, it appears as a clear mucilaginous fluid, slightly salt to the taste. Substances, when undergoing fermentation or putrefaction, are immediately checked in their action by the gastric juice, and are formed by its corrosive influence into a new fluid, possessed of entirely different properties, called *chyme*. But most mineral substances are indigestible. Certain tribes of savages, as the Otomacs, will, however, swallow daily large quantities of earth to allay the cravings of hunger. But this substance does not appear to be dissolved; it merely acts mechanically in distending the stomach.

The higher region of the alimentary canal is occupied by the stomach, which receives the food conveyed to it through the œsophagus or gullet. The form and structure of the stomach bear a constant relation to the nature of the food. In herbivorous animals, it is composed of a complicated system of reservoirs, where, by a slow and intricate process, the small quantity of nutriment contained in vegetable matter is abstracted and conveyed into the system. In carnivorous animals, the stomach is comparatively simple; and a supply of abundant nourishment is readily procured from animal food.

After passing through the stomach, the food is received into the remaining part of the canal, where it is acted upon by other juices destined to complete its preparation.

The chyme formed in the stomach having passed into the intestine, comes in contact with the bile and the pancreatic juice. An immediate change takes place. The chyme acquires the yellow colour and bitter taste of bile, and at length divides into two portions; the one, a white tenacious liquid called *chyle*, and the other, a yellow pulp.

The coats of the intestinal canal are supplied with pores, which imbibe that portion of the alimentary mass adapted for the nutrition of the body [being the chyle], while the useless residue is finally conveyed away and ejected.

The canal in which this first function of nutrition is performed, appears to be a continuation of the skin, and it is composed, in a similar manner, of laminæ. Even the surrounding fibres are analogous to those adhering to the internal surface of the skin, and called the fleshy pannicle. A mucous secretion takes place throughout this canal, which seems to have some connexion with the perspiration from the surface of the skin; for, when the latter is suppressed, the former becomes more abundant. The skin exercises a power of absorption very much resembling that possessed by the intestines.

The whole length of the intestinal canal is much greater in herbivorous than in carnivorous animals.

It is only in the very lowest tribes of animals that the same orifice is applied to the double purpose of receiving fresh supplies of aliment, and of ejecting the substances unfitted for nutrition. Their intestines assume the appearance of a sack with only one entrance. But in a far greater number of animals, having the intestinal canal supplied with two orifices, the nutritive juice [or chyle] is absorbed through the coats of the intestines, and immediately diffused [by the lacteals] through all the pores of the body. This arrangement appears to belong to the entire class of insects.

If we commence from the arachnides [or spiders] and the worms, and then examine all animals higher in the scale of creation, it will be found that the nutritive fluid circulates through a system of cylindrical vessels; and that it only supplies the several parts requiring nourishment by means of their ramified extremities [or lacteals], through which the nutriment is deposited in the places requiring sustenance. These vessels, which distribute the nutritive fluid or blood to all parts of the body receive the name of *arteries*. Those, on the contrary, are called *veins*, which restore the blood to the centre of the circulating system. This motion of the nutritive fluid is sometimes performed simply in one circle; often there are two circular motions, and even three, if we include that of the *vena-portæ* [which collects the blood of the intestines, and conveys it to the liver]. The velocity of its motion is frequently assisted by certain fleshy organs called *hearts*, which are placed at some one centre of circulation, often at both.

In the vertebrated and red-blooded animals, the nutritive fluid, or chyle, leaves the intestines either white or transparent; and is conveyed into the venous system, by means of particular vessels called lacteals, where it mixes with the blood. Other vessels similar to the lacteals, and composing with them one arrangement, called the lymphatic system, convey into the venous system those nutritive particles which have either escaped the lacteals, or have been absorbed through the cuticle or outer skin.

Before the blood is fitted to renovate the substance of the several parts of the body, it must receive, from the surrounding element, through the medium of respiration, that modification which we have already noticed. One part of the vessels belonging to those animals, which possess a circulating system, is destined to convey the blood to certain organs, where it is distributed over a large extent of surface, in order that the action of the surrounding element may be the more energetic. When the animal is adapted for breathing the air, this organ is hollow, and called *lungs*. But when the animal only breathes [the air dissolved] in water, the organ projects, and is called *branchiæ*, or *gills*. Certain organs of motion are always arranged so as to draw the surrounding element either within or upon the organ of respiration.

In animals which do not possess a circulating system, the air penetrates into every part of the body, through elastic vessels called *tracheæ;* or else water acts upon them, either by penetrating, in a similar manner, through vessels, or simply by being absorbed through the surface of the skin.

In Man, respiration is performed by means of the pressure and elastic force of the air, which rushes into the lungs, where a vacuum would otherwise have been formed by the elevation of the ribs, and the depression of the diaphragm. Muscular force then expels the air, after the necessary purification of the blood existing in the lungs has been performed; and the same actions are again repeated. The blood, which was of a dark purple colour, while slowly travelling from all parts of the body to the heart, has no sooner been purified by yielding its excess of carbonic acid to the surrounding air, and by absorbing oxygen, than its colour changes into a bright vermilion.

In Birds, it was necessary to combine lungs of small bulk with an extensive aeration of the blood; and, accordingly, the blood not only passes into the lungs, but through them into capacious air cells; from which, by the action of the chest, it is again expelled. The lungs thus act twice upon the same portion of air.

The change of the tadpole into the frog is accompanied by extraordinary alterations in its respiratory organs, which will be more fully explained hereafter. In the first, or tadpole state, the organs are branchial, in the frog they are pulmonary. The arrangements are striking and singular.

All respiration must be either *aquatic* or *atmospheric*. In the former case, the respiration is said to be *cutaneous* or *branchial*, according as it is performed through the *skin* or through *gills*. On the other hand, atmospheric respiration may be either *tracheal* or *pulmonary*, according as it is performed through the air-tubes called *tracheæ*, or by means of *lungs*.

After the blood has been purified by respiration, it is fitted to restore the composition of all parts of the body, and to execute the function of nutrition properly so called. The wonderful property, possessed by the blood, of decomposing itself so as to leave precisely, at each point, those particular kinds of particles which are there most wanted, constitutes the mysterious essence of vegetative life. We lose all traces of the secret process by which the restoration of the solids is performed, after having arrived at the ramified extremities of the arterial canals. But in the preparation of fluids we are able to trace appropriate organs, at once varied and complicated. Sometimes the minute extremities of the vessels are simply distributed over extended surfaces, from which the liquid exudes; and sometimes the liquid runs from the bottom of minute cavities. But the more general arrangement is, that the extremities of the arteries, before changing into veins, form particular vessels called *capillary*, which produce the requisite fluid at the exact point of union between these two kinds of vessels. The blood-vessels, by interlacing with the capillary vessels which we have just described, form certain bodies called *conglomerate* or *secretory glands*.

With all animals destitute of a circulation, and especially with insects, the nutritive fluid bathes the solid parts of the body; and each of them imbibes those particles necessary for its sustenance. If it become requisite that any particular fluid should be secreted, capillary vessels, adapted for this purpose, and floating in the nutritive fluid, imbibe, through their pores, the elements necessary for the composition of the fluid to be secreted.

It is thus that the blood continually renovates all the component parts of the body, and repairs the incessant loss of its particles, resulting necessarily from the continued exercise of the vital functions. The general idea which we are able to form of this process is sufficiently distinct, although the details of the operations performed at each particular point are involved in obscurity, from our ignorance of the precise chemical composition of each part, and our consequent inability to determine the exact conditions necessary for their reproduction.

In addition to the secretory glands necessary for performing a part in the internal economy of the system [such as the liver and the pancreas], there are others which secrete fluids destined to be rejected, either as being superfluous, or for some purpose useful to the animal. Of the latter we may mention the black fluid secreted by the Cuttle fish [with which, when pursued, he obscures the water to cover his retreat], and the purple matter of several Mollusca.

The function of GENERATION is involved in much greater obscurity and difficulty than that of simple secretion; and this difficulty attaches chiefly to the production of the germ. We have already explained the insuperable difficulties attending the pre-existence of germs; yet, if once we assume their existence, no particular difficulty remains attached to generation [which is not equally applicable to ordinary secretion]. While the germ adheres to the mother, it is nourished as if it formed a part of her own body; but when the germ detaches itself, it possesses a distinct life of its own, essentially similar to that of an adult animal.

The form of the germ, in its passage through the several progressive states of development, successively termed the embryo, the fœtus, and, finally, the new-born animal, never exactly resembles that of the parent; and the difference is often so very great that the change has received the name of *metamorphosis*. Thus, no person could ever anticipate that the caterpillar would finally be transformed into the butterfly, until he had either observed or been informed of the fact.

These remarkable changes are not peculiar to insects, for all living beings are more or less metamorphosed during the period of their growth; that is to say, they lose certain parts altogether, and develop others which were formerly less considerable. Thus, the antennæ, the wings, and all the parts of the butterfly, were concealed under the skin of the caterpillar; and, when the insect cast off its skin, the jaws, the feet, and other organs, which belong not to the butterfly, ceased to form a part of its body. Again, the feet of the frog are enclosed within the skin of the tadpole; and the tadpole, in order to become a frog, loses its tail, mouth, and gills or branchiæ.

Even the infant, before its birth, at that period, and during its progress to maturity, undergoes several metamorphoses. In the earlier periods of development, the embryo corresponds, in some of its parts, with certain of the lower animals. At first, it seems destitute of a neck, and the heart is situate in the place where a neck afterwards appears, an arrangement which is found to exist permanently in fish. There is also a striking resemblance between the lower extremity of the vertebral column in the embryo, and the tail of the fish. About the end of the fifth month, it is covered all over with a yellowish white silk, like the down of a young duck, which entirely disappears in six or seven weeks. The limbs are formed under the skin, and reaching it, gradually shoot out into their permanent position; yet, even when fully developed in other respects, the shoulders and thighs are still concealed under the skin. In this respect, the embryo resembles the horse and other animals, which have the shoulders and thighs permanently enveloped under a thick covering of muscle. The fingers, when first formed, are surrounded by a skin, which entirely covers them, like the mitten-gloves used for an infant. This covering is gradually absorbed, when it takes the form of a duck's web, and finally disappears. M. Tieddeman and M. Serres, have shown that the brain of the fœtus, in the highest class of animals, assumes in succession the various forms which belong to fishes, reptiles, and birds, before it acquires those additions and modifications which are peculiar to the mammalia. "If you examine the brain of the mammalia," says M. Serres, "at an early stage of uterine life, you perceive the cerebral hemispheres consolidated, as in fish, in two vesicles isolated one from the other; at a later period, you see them affect the configuration of the cerebral hemispheres of reptiles; still later again, they present you with the forms of those of birds; finally, they acquire, at the era of birth, and sometimes later, the permanent forms which the adult mammalia present."

As the infant grows towards manhood it loses, at a certain age, the thymus gland; by degrees it acquires hair, teeth, and beard; the relative size of its organs changes; the body increases at a much greater rate than the head, and the head more rapidly than the internal part of the ear.

Le lieu où les germes se montrent, l'assemblage de ces germes se nomme l'*ovaire;* le canal, par où les germes une fois détachés se rendent au dehors, l'*oviductus;* la cavité où ils sont obligés, dans plusieurs espèces, de séjourner un temps plus ou moins long avant de naître, la *matrice* ou l'*utérus;* l'orifice extérieur par lequel ils sortent, la *vulve.* Quand il y a des sexes, le sexe mâle est celui qui féconde; le sexe femelle celui dans lequel les germes paraissent. La liqueur fécondante se nomme *sperme;* les glandes qui la séparent du sang, *testicules;* et, quand il faut qu'elle soit introduite dans le corps de la femelle, l'organe qui l'y porte s'appelle *verge.*

SECT. VII.—A BRIEF NOTICE OF THE INTELLECTUAL FUNCTIONS OF ANIMALS.

Mind—Matter—Sensation—Illusions—Perception—Memory—Association of Ideas—Abstraction—Judgment—Faculties of Man and other animals compared—Instinct—Connexion between the Brain and Intellectual Faculties.

We have already explained, when treating of the nervous system. that before the mind can perceive an object, an impression must be made upon an organ of sense, either immediately, or through some material medium; and that this impression must be transmitted through the nerves to the brain.

But the manner in which sensation, and its consequent perception, are produced, is a mystery impenetrable to the human understanding; and, since philosophy is unable to *prove*[*] the existence of matter, it is only hazarding a gratuitous hypothesis to attempt to explain mind by materialism [or by analogies borrowed from the qualities of matter. The consideration of the Physiology of the Human Mind, or

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[*] First truths do not admit of proof; they are assumed. We cannot *prove* the existence of mind, but we are conscious of its existence; and we cannot *prove* the existence of matter, for we perceive it.

Metaphysics, forms the subject of another science]. But it is the province of the naturalist to ascertain the conditions of the body attendant on sensation,—to trace the extreme gradations of intellect in all living beings,—to investigate the precise point of perfection attainable by each animal,—and, finally, to ascertain whether there be not certain modifications of the intellectual powers, occasioned by the peculiar organization of each species, or by the momentary state of each individual body.

It has been already explained, that, to enable the mind to perceive, there must be an uninterrupted communication of nerves between the external organ of sense, and the central masses of the nervous system. The mind is, therefore, conscious only of some impression made upon these central masses. It follows, then, that the mind may be conscious of real sensations, without any corresponding affection of the external organ; and these may be produced either in the nervous chain of communication, or in the central masses themselves. This is the origin of dreams and visions, and of several casual sensations.

The various kinds of spectral illusions proceed from impressions, which being made on the retina, are thence communicated to the brain, and are referred by the mind to an object of actual existence. "When the eye or the head receives a sudden blow, a bright flash of light shoots from the eyeball. In the act of sneezing, gleams of light are emitted from each eye, both during the inhalation of the air, and during its subsequent protrusion; and in blowing air violently through the nostrils, two patches of light appear above the axis of the eye and in front of it, while other two luminous spots unite into one, and appear as it were about the point of the nose, when the eyeballs are directed to it. In a state of indisposition, the phosphorescence of the retina appears in new and more alarming forms. When the stomach is under a temporary derangement, accompanied by headache, the pressure of the blood-vessels upon the retina shows itself, in total darkness, by a faint blue light floating before the eye, varying in its shape, and passing away at one side. The blue light increases in intensity—becomes green and then yellow, and sometimes rises to red; all these colours being frequently seen at once; or the mass of light shades off into darkness. When we consider the variety of distinct forms which, in a state of perfect health, the imagination can conjure up when looking into a burning fire, or upon an irregularly shaded surface, it is easy to conceive how the masses of coloured light which float before the eye may be moulded, by the same power, into those fantastic and unnatural shapes which so often haunt the couch of the invalid, even when the mind retains its energy, and is conscious of the illusion under which it labours. In other cases, temporary blindness is produced by pressure upon the optic nerve, or upon the retina; and under the excitation of fever or delirium, when the physical cause which produces spectral forms is at its height, there is superadded a powerful influence of the mind, which imparts a new character to the phantasms of the senses." *

Many circumstances render it extremely probable, that the pictures drawn in the mind by memory, or created by imagination, do not merely exist "in the mind's eye," but are actually figured on the retina. During health, and in ordinary cases, these images are faint, and are easily distinguished from the sensations resulting from real perception. It is only when the body is affected by certain diseases, or during sleep, that the impressions on the retina appear to proceed from objects in actual existence.

Several instances might be brought forward to illustrate the illusions of the senses. By the well-known experiment of making a galvanic circuit through the tongue, a piece of zinc and one of silver, there is produced a pungent metallic taste, in the same manner as would have followed the real application of a sapid substance. Thus it may be seen that, if we communicate an impression to the nerve on its passage to the central mass, the mind will be affected in the same manner as if the impression had been made on the external organ.

By the terms *central masses*, we understand a certain portion of the nervous system, which is always more circumscribed as the animal is more perfectly constructed. In Man it is exclusively a limited portion of the brain. On the contrary, in reptiles the central mass may include either the brain, the entire marrow, or any portion of them taken separately; so that the absence of the entire brain does not deprive them of sensation. The extension of the term, when applied to lower classes of animals, is much greater, as their sensitive power is still more widely diffused.

We are hitherto completely ignorant of the nature of the changes which take place in the nerves and brain during perception, and of the manner in which the process is carried on. Analogies derive from matter, sensible species, images, and vibrations, obscure rather than explain this mysterious subject.

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* Letters on Natural Magic, by Sir David Brewster.

A certain state of mind follows a certain impression upon an external organ. We refer the cause of the sensation to some external object. This constitutes *perception;* and the mind is said to form an *idea* of the object. By a necessary law involved in the constitution of the mind, all the ideas of material objects are in time and in space.

When an impression has once been made through the medullary masses upon the mind, it possesses the power of recalling the impression after the exciting cause has been removed. This is *memory,* a faculty which varies much with the age and health of the individual.

During childhood, and in youth, the memory is very vivid. Accordingly, this period of life is most favourable to the acquisition of knowledge, especially of those subjects involving a great extent of detail, such as languages, geography, civil history, and natural history. The memory fails with increasing years.

Vivid perceptions and sensations are easily conceived; but the memory of a former mental impression is in general more faint.

Certain diseases, such as apoplexy, destroy the memory, either entirely or partially. A disordered state of the stomach will deprive the mind of the power of following a continued train of deep thought. This is also the case in the first stages of fevers. Blows and other injuries of the head will often affect the memory in a manner altogether incredible and surprising; and similar effects are sometimes produced by a high degree of nervous excitement.

Ideas which resemble [which contrast], or which were produced at the same time [or in the same place], have the power of recalling each other. This is termed the *association of ideas.* The order, the extent, and the quickness in which this power is exercised, constitutes the perfection of the memory.

Every object presents itself to the memory with all its qualities, and all the ideas associated therewith. The understanding possesses the power of separating these associated ideas from the objects, and of combining all the properties resembling each other in different objects under one general idea. This power of generalization, by which an object is imagined to be divested of certain properties, which in reality are never found separate, is termed *Abstraction.*

The power of abstraction appears to belong exclusively to Man; who, by the invention of general terms, is enabled to reason concerning entire classes of objects and events, and to arrive at general conclusions, comprehending a multitude of particular truths.

Every sensation being more or less agreeable, or disagreeable, experience and repeated trials readily point out the movements necessary to procure the one, or to avoid the other. The understanding thence deduces general rules for the direction of *the will* relatively to pleasure and pain.

An agreeable sensation may produce unpleasant consequences; and the foresight of these consequences may react upon the first sensation, and thus produce certain modifications of the abstract rules framed by the understanding. This is *prudence* or *self-love.*

The lower animals seem influenced only by their present or very recent sensations, and they invariably yield to the impulse of the moment. Man alone appears able to form the general idea of *happiness,* and, by taking a comprehensive view of things, to lay down a plan for the regulation of his future conduct, and the attainment of his favourite objects.

But an inseparable barrier is placed between man and inferior intelligences, by the power of perceiving those qualities of actions which are termed *right* and *wrong,* and the emotions which attend their perception. The supremacy of conscience, and its claim to be considered an original faculty of the mind, are clearly pointed out by Bishop Butler. "Virtue," he elsewhere observes, "is that which all ages and all countries have made profession of in public—it is that which every man you meet puts on the show of—it is that which the primary and fundamental laws of all civil constitutions over the face of the earth make it their business and endeavour to enforce the practice of upon mankind, such as justice, veracity, or a regard for the common good."

By applying terms to express our general ideas, we obtain certain formulæ or rules, which are easily adapted to particular cases. This is *judgment* or *reasoning* [which may be either *intuitive* or *deductive*].

When original sensations and associations forcibly recur to the memory [the mind possesses the power of combining and arranging them, to form a new creation of its own], this is called *imagination,* and it may be accompanied by agreeable or painful associations.

Man being endowed with superior privileges, possesses the faculty of connecting his general ideas with particular signs. These are more or less arbitrary, easily fixed in the memory, and serve to suggest the general ideas, which they were intended to represent. We apply the term *symbols* to designate these signs when associated with our general ideas, and they form a *language* when collectively arranged. Language may be addressed either to the ear or to the eye; in the former case it is termed *speech*, in the latter, *hieroglyphics*. *Writing* is a series of images, by which the elementary sounds are represented to the eye [under the form of *letters*]. By combining them [into *words*], the compound sounds of which speech is composed are readily suggested. Writing is therefore an indirect representation of our thoughts.

This power of representing general ideas by particular signs or symbols, which are arbitrarily associated with them, enables us to retain an immense number of distinct ideas in the memory, and to recall them with facility. Innumerable materials are thus readily supplied to the reasoning faculty and to the imagination. The experience of individuals is also communicated by written signs to the whole human species, and by this means the foundation is laid for their indefinite improvement in knowledge through the course of ages.

The art of printing, by multiplying copies, has insured the permanence of knowledge, and has afforded a powerful aid to the intellectual progress of the species.

This capacity for indefinite improvement forms one of the distinguished characters of human intelligence.

The most perfect animals are infinitely below Man, in respect to the degrees of their intellectual faculties; but it is nevertheless certain that their understandings perform operations of the same kind. They move in consequence of sensations received; they are susceptible of lasting affections; and they acquire by experience a certain knowledge of external things, sufficient to regulate their motions, by actually foreseeing their consequences, and independently of immediate pain and pleasure. When domesticated, they feel their subordination. They know that the being who punishes them may refrain from doing so if he will, and they assume before him a supplicating air, when conscious of guilt, or fearful of his anger. The society of man either corrupts or improves them. They are susceptible of emulation and of jealousy; and, though possessed among themselves of a natural language, capable of expressing the sensations of the moment, they acquire from man a knowledge of the much more complicated language through which he makes known his pleasure, and urges them to execute it.

We perceive, in fact, a certain degree of reason in the higher animals, and consequences resulting from its use and abuse, similar to those observed in Man. The degree of their intelligence is not far different from that possessed by the infant mind, before it has learned to speak. But, in proportion as we descend in the scale of creation to animals far below man in organization, these faculties become more languid; and, in the lowest classes, they are reduced to certain motions obscurely indicating some kind of sensation, and the desire of avoiding pain. The degrees of intellect between these extremes are infinite.

Dogs, cats, horses, birds, and other animals, may have their original faculties modified by personal experience; and they are accordingly trained to the performance of those extraordinary feats which in all countries form a favourite amusement of the people. "By experience," says Mr. Hume, "animals become acquainted with the more obvious properties of external objects; and gradually, from their birth, treasure up a knowledge of the nature of fire, water, stones, earth, heights, depths, &c. The ignorance and inexperience of the young are here plainly distinguishable from the cunning and sagacity of the old, who have learned by long observation to avoid what hurt them, and pursue what gave ease and pleasure. A horse that has been accustomed to the field, becomes acquainted with the proper height he can leap, and will never attempt what exceeds his force and ability. An old greyhound will trust the more fatiguing part of the chase to the younger, and will place himself so as to meet the hare in her doubles; nor are the conjectures which he forms on this occasion founded on any thing but his observation and experience. This is still more evident from the effects of discipline and education on animals, who, by the proper application of rewards and punishments, may be taught any course of action the most contrary to their natural instincts and propensities. Is it not experience which renders a dog apprehensive of pain, when you menace him, or lift up the whip to beat him? Is it not even experience which makes him answer to his name, and infer, from such an arbitrary sound, that you mean him rather than any of his fellows, and intend to call him when you pronounce it in a certain manner and with a certain accent?

There exists, however, in a great number of animals, a faculty different from intelligence, called *instinct*. This power causes them to perform certain actions necessary to the preservation of the species, but often altogether removed from the apparent wants of the individual. These are often so very complicated and refined, that it is impossible to suppose them the result of foresight, without admitting a degree of intelligence in the species performing them, infinitely superior to what they exhibit in other respects. The actions proceeding from instinct are still less the effect of imitation, for the individuals executing them have sometimes never seen them performed by others. The degree of instinct is by no means proportioned to the general intelligence of the species; but it is in those animals which, in their other actions, manifest the utmost stupidity, that instinct appears most singular, most scientific, and most disinterested. It is so much the property of each entire species, that all individuals exercise it in precisely the same manner, without ever attaining to higher degrees of cultivation.

"Every other animal but Man, from the first outset of the species and of the individual, is equal to his task; proceeds in the shortest way to the attainment of his purpose, and neither mistakes the end nor the means by which it is to be obtained. In what he performs, we often justly admire the ingenuity of the contrivance and the completeness of the work. But it is the ingenuity of the species, not of the individual; or rather, it is the wisdom of God, not the deliberate effect of invention or choice, which the created being is fitted to employ for himself. His task is prescribed, and his manner of performing it secured. Observe the animals most remarkable for a happy choice of materials, and for the curious execution of their works. The bird, how unvaried in the choice of the matter she employs in the structure, or in the situation she has chosen for her eyrie or nest! Insects, most exquisitely artful in the execution of their little works, for the accommodation of their swarms, and the lodgment of their stores; how accomplished in their first and least-experienced attempts! how uniform and unchanged in the last! Nature appears to have given to the other animals a specific direction to the means they are to employ, without any rational conception of the end for which they are to employ them."

Thus, the working bees, from the creation of the world, have always constructed edifices of great ingenuity, upon principles deduced from the highest branches of geometry, for the purpose of lodging and nourishing a posterity which is not even their own.

"It is a curious mathematical problem," observes Dr. Reid, "at what precise angle three planes which compose the bottom of a cell in a honey-comb ought to meet, in order to make the greatest saving, or the least expense, of material and labour; and this is the very angle in which the three planes in the bottom of a cell do actually meet. Shall we ask here, who taught the bee the properties of solids, and to resolve the problems of *maxima* and *minima*? We need not say that bees know none of these things. They work most geometrically, somewhat like a child, who, by turning the handle of an organ, makes good music, without any knowledge of music. The art is not in the child, but in HIM who made the organ. In like manner, when a bee makes its comb so geometrically, the geometry is not in the bee, but in that Great Geometrician who made the bee, and made all things in number, weight, and measure."

The solitary bees and wasps construct very complicated nests for the reception of their eggs. From each egg there proceeds a worm which has never seen its mother, which knows not the structure of the prison enclosing it; and yet, after it has undergone its metamorphosis, will construct another nest, precisely similar, to contain its own egg.

No satisfactory explanation can be given of the phenomena of instinct, except we admit that these animals possess some innate and constant internal power, which determines them to act, in the same manner as when they are influenced by ordinary and accidental sensations. Instinct haunts them like a perpetual reverie or vision; and all the actions proceeding therefrom may be compared to those of a man walking in his sleep.

Instinct has been wisely bestowed upon animals by the Creator, to supply the defects of their understandings, the want of bodily force or fecundity; and thus the continuation of each species is secured to the proper extent.

There is no visible mark, in the conformation of an animal, by which we can ascertain the degree of instinct which it possesses. But so far as observation has hitherto extended, the degree of intelligence seems proportioned to the relative size of the brain, and especially of its hemispheres.

Without venturing to decide upon this point, we must remark that the latter assertion has been controverted by many recent observers, especially by Dr. Herbert Mayo, in his valuable Outlines of Human Physiology. "It does not appear," he remarks, "that an increase in the absolute weight of the brain confers a superiority in mental endowments. Were this the case, the intellects of the whale and of the elephant should excel the rational nature of man. Neither does the relative weight of the brain to the whole body appear the measure of mental superiority. The weight of the human brain is but one thirty-fifth part, while that of a canary bird is one-fourteenth part. Nor in conjunction with parity of form, and structure even, does this relation appear of any value. The eagle is probably as sagacious as the canary bird; but the weight of the brain is but one two-hundred-and-sixtieth part of its entire weight.

"We may next inquire," he proceeds, "whether an increasing number and complication in the parts of the brain is essentially connected with improved mental functions. The first instances which occur to the mind are in favour of the affirmative of this supposition. It may be inferred, from their docility and surprising capability of receiving instruction, that birds have higher mental endowments than fish; and accordingly, in place of the nodules of the fishes' brain, which are scarcely more than tubercles to originate nerves, birds possess an ample cerebrum and cerebellum (or lobes of their brain). But in pursuing this argument, if we compare, on the other hand, the brain of birds with those of alligators and tortoises, we find no striking difference or physical superiority in the former over the latter; yet in mental development, the tortoise and alligator are probably much nearer to fish than to birds. The *instantia crucis* (or decisive experiment), however, upon this question, is found in the comparison of the brain of the cetaceous mammalia (such as whales or dolphins), with the human brain on the one hand, and with that of fish on the opposite.

"The cetaceous mammalia," he observes, "have brains which, besides being of large size, are nearly as complicated as those of human beings; they might therefore be expected, if the opinion which I am combating were true, to manifest a remarkable and distinguishing degree of sagacity. Endowed with a brain approaching nearly in complexity and relative size to that of man, the dolphin should resemble in his habits one of the transformed personages in eastern fable, who continued to betray, under a brute disguise, his human endowments. Something there should be, very marked in his deportment, which should stamp his essential diversity from the fishes in whose general mould he is cast. His habits too, not shunning human society, render him especially open to observation; and the class of men who have the constant opportunity of watching his gambols in the deep, are famed for their credulity, and delight to believe in the mermaid, the sea snake, and the kraken. Yet the mariner sees nothing in the porpoise or the dolphin but a fish, nor distinguishes him except by his unwieldy bulk, from the shoal of herrings he pursues. The dolphin shows, in truth, no sagacity or instinct above the carp, or the trout, or the salmon. It is probable even that the latter, which have but the poorest rudiment of a brain, greatly exceed him in cunning and sagacity. I am afraid that the instance which I have last adduced is sufficient to overthrow most of the received opinions respecting the relation of the size, shape, and organization of the brain to mental development; nor is it easy to find a resting-place for conjecture upon this subject."

SECT. VIII.—ON THE CLASSIFICATION OF THE ANIMAL KINGDOM.

General Distribution of the Animal Kingdom into Four Great Divisions.—1. Vertebrata—2. Mollusca—3. Articulata—4. Radiata.

After the observations which have already been made concerning systems of classification in general, we have now to ascertain those leading characters of animals, upon which we must found the primary divisions of the Animal Kingdom. It is evident that these must be derived from the animal functions, that is, from sensation and motion; for not only do these functions constitute them animals, but they point out the rank which they hold in the animal world.

Observation confirms the correctness of this reasoning, by showing that their development and intricacy of structure correspond in degree with those of the organs performing the vegetative functions.

The heart and the organs of circulation form a kind of centre for the vegetative functions, in the same manner as the brain and the trunk of the nervous system are the centres of the animal functions; for we see these two systems become gradually more imperfect, and finally disappear together. In the very lowest classes of animals, where nerves can no longer be discovered, all traces of muscular fibres are obliterated, and the organs of digestion are simply excavated in the uniform mass of their bodies. The vascular system [or systematic arrangement of vessels] in insects, disappears even before the nervous; but, in general, the medullary masses are dispersed in a degree corresponding to the agents of muscular motion. A spinal marrow, on which are various knots or ganglions, representing so many brains, corresponds exactly to a body divided into numerous annular [or ring-like] segments, supported upon pairs of limbs, distributed along its entire length.

This general agreement in the construction of animal bodies, resulting from the arrangement of their organs of motion, the distribution of the nervous masses, and the energy of the circulating system, ought, then, to form the basis of the primary divisions of the Animal Kingdom. We shall now proceed to examine what the characters are, which ought to succeed immediately to the above, and give rise to the first subdivisions.

If we divest ourselves of the popular prejudices in favour of long-established divisions, and consider the Animal Kingdom upon the principles already laid down, without reference to the size of the animals, their utility, the greater or less knowledge we may have of them, or to any of these accidental circumstances, but solely in reference to their organization and general nature, we shall find that there are four principal forms, or (if we may use the expression) four general plans, upon which all animals appear to have been modelled. The minor subdivisions, by whatever titles they may be ornamented by Naturalists, are merely slight modifications of these great divisions, founded upon the greater development or addition of some parts, while the general plan remains essentially the same.

1. VERTEBRATA—*Vertebrated Animals.*

In the first of these forms, which is that of Man, and of the animals most resembling him, the brain and the principal trunk of the nervous system are enveloped in a bony covering, composed of the cranium [or skull], and the vertebræ [or bones of the neck, back, and loins]. To the sides of this medial column are attached the ribs, and the bones of the limbs, forming collectively the framework of the body. The muscles, in general, enclose the bones which they set in motion, and the viscera are contained within the head and trunk.

Animals possessed of this form are called Vertebrated Animals (*Animalia vertebrata*) [from their possessing a *vertebral* column or spine].

They are all supplied with red blood, a muscular heart, a mouth with two jaws, one being placed either above or before the other, distinct organs of sight, hearing, smell, and taste, in the cavities of the face, and never more than four limbs. The sexes are always separate, and the general distribution of the medullary masses, with the principal branches of the nervous system, are nearly the same in all.

Upon examining attentively each of the parts of this extensive division of animals, we shall always discover some analogy among them, even in species apparently the most removed from each other; and the leading features of one uniform plan may be traced from man to the lowest of the fishes.

The following are examples of Vertebrated Animals: Man, quadrupeds, whales, birds, serpents, frogs, tortoises, herrings, carps, &c.

2. MOLLUSCA—*Molluscous Animals.*

In the second form of animals we find no skeleton. The muscles are attached solely to the skin, which forms a soft envelop, capable of contracting in various ways.

In many species earthy laminæ or plates, called shells, are secreted from the skin, and their position and manner of production are analogous to those of the mucous bodies. The nervous system is placed within this covering along with the viscera; and the former is composed of numerous scattered masses, connected by nervous filaments. The largest of these masses are placed upon the œsophagus, or gullet, and are distinguished by the term *brain*. Of the four senses which are confined to particular organs, we can discover traces only of taste and of sight, but the latter is very often found wanting. In only one family, however, there are exhibited the organs of hearing. We always find a complete circulating system, and particular organs for respiration. The functions of digestion and of secretion are performed in a manner very nearly as complicated as in the vertebrated animals.

Animals possessed of this second form are called Molluscous Animals (*Animalia mollusca*) [from the Latin, *mollis*, soft].

Although the general plan adopted in the organization of their external parts is not so uniform as in the vertebrated animals, yet, in so far as regards the internal structure and functions, there is at least an equal degree of mutual resemblance

The cuttle-fish, oyster, slug, and garden-snail, are familiar instances of this class of animals.

3. ARTICULATA—*Articulated Animals.*

The third form is that which may be observed in insects and worms. Their nervous system consists of two long cords, extending the entire length of the intestinal canal, and dilated at intervals by various knots, or ganglions. The first of these knots, placed upon the œsophagus or gullet, and called the brain, is scarcely larger than any of the others, which may be found arranged along the intestinal canal. It communicates with the other ganglions by means of small filaments, or threads, which encircle the œsophagus like a necklace. The covering of their body is divided into a certain number of ring-like segments, by transverse folds, having their integuments sometimes hard, sometimes soft, but always with the muscles attached to the interior of the envelop. Their bodies have frequently articulated limbs attached to the sides, but they are also very frequently without any.

We shall assign the term Articulated Animals (*Animalia articulata*) to denote this numerous division, in which we first observe the transition from the circulating system in cylindrical vessels of the higher animals, to a mere nutrition, by imbibing or sucking in the alimentary substances; and the corresponding transition, from respiration through particular organs, to one performed by means of tracheæ, or air-cells, dispersed throughout the body. The senses most strongly marked among them are those of taste and sight. One single family exhibits the organ of hearing. The jaws of the Articulated Animals are always lateral, but sometimes they are altogether wanting.

As instances of this form, we may mention the earth-worm, leech, crabs, lobsters, spiders, beetles, grasshoppers, and flies. From the circumstance of their coverings, or limbs, being divided, or jointed, they derive the name of "articulated," from the Latin *articulus*, a little joint.

4. RADIATA—*Radiated Animals.*

To the fourth and last form, which includes all the animals commonly called Zoophytes, may be assigned the name of Radiated Animals (*Animalia radiata*). In all the other classes the organs of motion and of sensation are arranged symmetrically on both sides of a medial line or axis; while the front and back are quite dissimilar. In this class, on the contrary, the organs of motion and of sensation are arranged like rays around a centre; and this is the case even when there are but two series, for then both faces are similar. They approach nearly to the uniform structure of plants; and we do not always perceive very distinct traces of a nervous system, nor of distinct organs for sensation. In some we can scarcely find any signs of a circulation. Their organs for respiration are almost always arranged on the external surface of their bodies. The greater number possess, for intestines, a simple bag or sac, with but one entrance; and the lowest families exhibit nothing but a kind of uniform pulp, endowed only with motion and sensation.

The following are instances of this singular class of animals:—The sea-nettle, polypus, hydra, coral, and sponge. The name zoophyte is derived from two Greek words, ζωον (*zoon*), an animal; φυτον (*phyton*), a plant; while that of *radiata*, derived from the Latin, evidently points out the *radiated* or *ray-like* arrangement of their parts.

"Before my time," says the Baron Cuvier in a note to his first edition, "modern naturalists divided all Invertebrated Animals into two classes—Insects and Worms. I was the first who attacked this view of the subject, and proposed another division, in a paper read before the Society of Natural History at Paris, the 21st Floreal, year iii. (or 10th May, 1795), and which was afterwards printed in the "*Decade Philosophique*." In this paper, I pointed out the characters and limits of the Mollusca, the Crustacea, the Insects, the Worms, the Echinodermata, and the *Zoophytes*. The red-blooded worms, or Annelides, were not distinguished until a later period, in a paper read before the Institute, on the 11th Nivose, year x. (or 31st December, 1801.) I afterwards distributed these several classes into three grand divisions, analogous to that of the Animalia Vertebrata, in a paper read before the Institute in July 1812, and afterwards published in the *Annales du mus. d'Histoire Nat.* tome xix."

SECT. IX.—GENERAL REVIEW OF LIVING BEINGS.

Life—Animals and Plants—Definition of an Animal.

When we contemplate the face of the earth, we perceive it to be covered with living beings. Animals and plants are to be found in every corner of the globe, with the exception of the poles, where perpetual frosts and the long darkness of winter render the land incapable of supporting them; and where, to use the words of the poet, "Life itself goes out." We even find the remains of living bodies at enormous depths below the surface, in spots which once formed the beds of running streams, or the bottom of a mighty ocean, from which situations they have been elevated by the ordinary laws of volcanic agency. The mould forming the surface of the earth is composed of the remains of generations which are now no more: it serves to maintain the growth of living plants, and, through them, of all living animals. In the atmosphere surrounding the globe, every thing is fitted for life: light and heat bring organized bodies into existence; the air, covering the earth in every direction to the depth of many leagues, continually exchanges its particles with those of living bodies. Finally, water, which passes incessantly from the sea to the clouds, and from the clouds to the sea, is another element essential to life.

Life is one of those mysterious and unknown secondary causes, to which we assign a certain series of observed phenomena, possessing mutual relations, and succeeding each other in a constant order. It is true that we are completely ignorant of the link which unites these phenomena, but we are sensible that a connexion must exist; and this conviction is sufficient to induce us to assign to them one general name, which is used in two senses: first, as the sign of a particular principle; and, secondly, as indicating the totality of the phenomena which have given rise to its adoption.

As the human body, the bodies of the other animals, and of plants, appear to resist, during a certain time, the laws which govern inanimate bodies, and even to act on all around them in a manner opposed altogether to those laws, we employ the terms *Life* and *Vital Principle* to designate these apparent exceptions to general laws. It is, therefore, by determining exactly in what these exceptions consist, that we shall be able to understand clearly the meaning of those terms. For this purpose, let us consider living bodies in their active and passive relations to the rest of nature.

For example, let us contemplate a female in the prime of youth and health. The elegant form, the graceful flexibility of motion, the gentle warmth, the cheeks crimsoned with the blushes of beauty, the brilliant eyes sparkling with the fire of genius, or animated with the sallies of wit, seem united to form a most fascinating being. A moment is sufficient to destroy the illusion. Motion and sense often cease without any apparent cause. The body loses its heat, the muscles become flat, and the angular prominences of the bones appear; the cornea of the eye loses its brightness, and the eyes sink. These are, however, but the preludes of changes still more horrible. The neck and abdomen become discoloured, the cuticle separates from the skin, which becomes successively blue, green, and black. The corpse slowly dissolves, a part combining with the atmosphere, a part reduced to the liquid state, and a part mouldering in the earth. In a word, after a few short days there remain only a small number of earthy and saline principles. The other elements are dispersed in air and water, prepared again to enter into new combinations, and to become the constituent particles, perhaps, of another human body.

It is evident that this separation is the natural effect of the action of the air, heat, and moisture;

in a word, of external matter upon the dead animal body; and that its cause is to be found in the elective attraction of these different agents for the elements of which the body is composed. That body, however, was equally surrounded by those agents while living, their affinities for its molecules were the same, and the latter would have yielded in the same manner during life, had not their cohesion been preserved by a power superior to those affinities, and which never ceased to act until the moment of death.

All living beings are found to possess one common character, whatever differences may prevail among them. They are all born from bodies similar to themselves, and grow by attracting the surrounding particles which they assimilate with their substance. All are formed with different parts, which we call *organs*, and from which they derive the appellation of *organized* beings. These organs united together form a whole, which is a perfect unity in respect to form, duration, and the phenomena it exhibits; and, as one of these properties cannot be abstracted from the rest without annihilating the whole, a living being receives the name of *individual*. Each being possesses a degree of heat, differing in different beings, and, to a certain point, independent of surrounding bodies. They all resist the laws of affinity which sway the mineral kingdom, and the compositions which they form are submitted to laws different from those influencing the mixtures of the chemist. They all absorb something from without, and transform it within; and all exhale certain principles, the product of the vital action. All reproduce other and similar beings, by the same actions by which they were themselves produced. All exist for a time, variable for each individual, but nearly the same for the same species, when in the wild state of nature. After this active individual existence, they all cease to live; and, finally, their bodies are dissipated into their more simple elements, according to the universal laws of Inorganic Chemistry.

Thus every living being forms, by its unity, a little world within itself; yet this little world cannot remain isolated from the universe without. In life, there is always a bond of mutual dependence among the organs—a universal concourse and agreement of actions. Every part corresponds with the whole, and the whole with the universe.

If, then, we wish to distinguish a living body from another organized body, but without life, we have only to ascertain whether it continue to interchange particles with the soil, or gaseous fluids, which surround IT; or. on the contrary, whether it maintain no active or efficacious relations with the universe. Again, if we wish to distinguish an organized body, which has ceased to live, from a mineral, we have only to ascertain whether the particles are otherwise united than by the ordinary molecular attractions, and whether the free action of the elements is about to annihilate it either by destruction or putrefaction.

The division of Living Beings into Animals and Plants has been already explained. The former, being of a complex nature, are provided with an internal cavity which receives their aliment, and are endowed with sense and spontaneous motion. Directed by instinct, they are alike capable of avoiding injury, and of pursuing their natural good. The latter, fixed to the earth by their roots, and deprived of the faculties of sensation and motion, are placed by Nature in situations fitted to supply their wants. The materials necessary for their sustenance are absorbed directly, without instinct or motion, and are abundantly supplied without either preparation or complicated labour. Animals, endowed with the distinctions of sex, both of which sometimes co-exist in the same individual, but more frequently in separate individuals of the same species, preserve these distinctions during the whole period of their lives. Almost all plants, on the contrary, have the two sexes united in the same being; and the distinctive characters of sex are lost and renewed every year. Again, the internal structure of animals is more complicated than that of plants: it is *internally* that the great functions of life are performed. With plants, on the contrary, the principal organs are placed on the surface; and their functions are mostly performed *externally*. As soon as an animal is born, its organs are exhibited: they require nothing but development and growth to form a perfect animal; and, if we except certain metamorphoses, the external form of the adult is already sketched. The vegetable, born from a seed, develops its organs successively; first the root, then the stalk, leaves, and flowers;—and when the flowers have bloomed, they die; the rest of the organs perish, the whole ceases to live, or sometimes only the stalk, or perhaps only the leaves. Not a year elapses but each flower is destroyed or renewed, partially or entirely. Thus, the two classes of beings possess in common the powers of nutrition and of reproduction. The animal has, however, something more than the vegetable, and enjoys the higher powers of sensation and voluntary motion. The animal alone possesses nerves, muscles, blood, and some kind of stomach. One at least of these organs is always visible; and, as the nerves and muscles are intermittent in their action, and incapable of maintaining a long-continued exercise without repose, animals possess a new distinctive mark in that periodical sleep to which they are at intervals subjected.

To a person who has considered Life only in Man, or in those higher animals which most resemble him, it appears almost superfluous to explain the essential difference between an animal and a plant. If there existed upon the face of the earth only such animals as birds, fishes, or quadrupeds, there would then be no occasion to enlarge so fully upon the distinctions in their functions: the line drawn by the hand of Nature would suffice. We should readily be preserved from error on this point by their senses, their voluntary motion, the symmetry and complexity of their structure, but, above all, by the instinct which directs their actions. Then we might say with Linnæus, "Vegetabilia crescunt et vivunt; Animalia crescunt, vivunt et sentiunt" (Vegetables grow and live; Animals grow, live, and feel); and this definition would be as accurate as it is brief. We should not be obliged to separate Corals, Polypi, Insects, Crustacea, and Symmetrical Shells, from the Vegetable Kingdom.

But such is not the case. All animals do not exhibit the distinctive marks of complicated structure and voluntary motion. This may be easily inferred from the fact, that Tournefort, a man of great talents, and an able naturalist, actually formed nine genera in the seventeenth family of his Botanical system with those Polypi which were known to him and to his learned contemporaries. At a later period, Trembley hesitated for a long time before he could determine whether the Hydra was an animal or a plant; and the experiments which he performed to determine the question have been admired by all the philosophers of his time. The dexterous manipulations of Trembley are the more remarkable, as Peyssonel had previously observed that minute animals inhabit the different compartments of the corals. This discovery was extended by Ellis and Solander to all kinds of Polypi; while Donati, Réaumur, and B. de Jussieu, brought the subject prominently forward in their public lectures and writings. The question, however, still remained in an unsatisfactory state, and attracted the attention of the distinguished naturalists of the eighteenth century. Buffon proposed to establish an intermediate class between animals and plants. Linnæus adopted this suggestion, although it proceeded from Buffon; and rendered the distinction permanent by the title of Zoophytes, or Animated Plants. The celebrated Pallas followed Linnæus; Cuvier adopted the word and the distinction; while Lamarck rejected them both.

These doubts and differences of opinion among enlightened men could only have proceeded from the obscurity of the subject. One cause of the obscurity arose from the false direction which their studies had unfortunately taken. Confining themselves to their cabinets, naturalists remained too far from Nature. They had found solid bodies—Corals, Sponges, Alcyonia, Polypi, of innumerable shapes, sometimes covered with soft and moveable bodies, and sometimes without them. Instead of considering the soft body as the artificer of the solid mass, they believed that the latter produced the former; and as the solid masses were observed to grow and vegetate, they were hastily considered to be plants, while the soft bodies were regarded as the flowers of these extraordinary vegetables. The error was farther confirmed by the circumstance, that at the particular period when these Polypi reproduce other beings of the same species, their bodies are covered with little buds and shoots, which bear a great resemblance to certain flowers, the structure of which cannot be very distinctly perceived. But when these supposed flowers were observed to be endowed with spontaneous motion, and that they were possessed of sensation, a great difficulty arose; and the name of Zoanthes, or *animated flowers*, was assigned to them.

It has now, however, been completely ascertained that the Polypi themselves fabricate these solid apparent vegetables, which serve for their abodes. They secrete them in very nearly the same manner as the Mollusca form their shells; the Teredo its testaceous tube; the Lobster its crustaceous envelop; the Tortoise its shield; the fishes their scales; insects their elytra or wing-cases; birds their plumage; the Armadillo his scaly covering; the whales their horny laminæ; quadrupeds their skins and organs of defence; and Man, his hair, nails, and cuticle. In all these beings there are to be found some parts which vegetate; and if it were necessary to class with plants all beings which are found to vegetate in any of their parts, we ought, consistently, to include all the animals just named with Zoophytes or animated plants of Linnæus and Pallas.

The following are the characters by which we may always ascertain whether a living being, organized, growing, drawing in nutriment, possessing an internal temperature peculiar to itself, and reproducing its kind, be an Animal or a Plant.

If it be irritable to the touch, and moves spontaneously to satisfy its wants,—if it be not deeply rooted in the soil, but only adhere to the surface,—if its body be provided with a central cavity,—if it putrefy after death,—if it give out the ammoniacal odour of burnt horn,—and finally, if in its chemical composition there be found an excess of azote over carbon,—then we may be certain that it is an Animal. But if, on the contrary, the doubtful being under examination enjoy no lasting or spontaneous power of motion,—if it be destitute of an internal cavity,—if it be deeply inserted in the soil,—if, when detached, it speedily fade and die,—if, when dead, it merely ferment, but do not putrify,—if it burn without the odour of a burnt quill or horn,—and if its residue be very considerable and chiefly carbon,—then we may venture to declare it to be a Plant.

These characters are sufficient, and can, in general, be easily ascertained. In this enumeration, no allusion has been made to sensation as a distinctive mark of the two classes of living beings; because, in the lowest classes of animals, where alone any difficulty can arise, it is only from the property of irritability that we can infer sensation. The phenomena of reproduction have likewise not been alluded to, because it is in the lowest animals, which we are the most likely to confound ith plants, that this power is still involved in great obscurity, or altogether unknown. It is not, s we might at first sight suppose, the most perfect, or, to speak more correctly, the most compli-ated plants that are likely to be mistaken for animals. A moment's reflection will readily show ow utterly impossible it is to confound a plant, bearing leaves and flowers, with any animal what-ver. But it is otherwise with the less characterized beings; and the Animal and Vegetable King-oms may be compared to two mighty pyramids, which touch each other by their bases, while heir opposite vertices diverge to two infinitely remote points in either direction.

We have thus shown how extremely difficult it is to characterize the essential differences of ani-als and plants in one short definition. Even Cuvier himself, who spent twenty years of his life in xamining the organization of animals, from the simple Polypus up to Man, has carefully abstained om proposing any such definition.

This difficulty increases in proportion to the number of animals under examination. It does not onsist in ascertaining the characters appropriated to particular animals, but in selecting such a ait as shall be common to them all. We know that none but animals are possessed of a brain, erves, muscles, heart, lungs, stomach, or skeleton. We know that they alone move, digest, respire; at they alone have blood, and seem to feel;—but the point is to ascertain which of these characters mains throughout the vast chain of beings, and which of them can be traced in the last link as ell as in the first. We see the lungs disappear, then successively the glands, the brain, the skeleton, e heart, the gills, the blood, the nerves, the muscles, and finally, even the vessels; while in the west animals of all, we can scarcely ascertain whether they possess a digestive cavity or a stomach. owever, as we find this last-mentioned organ in almost all animals, and as it can be clearly ob-rved even in those which have no other externally visible organ, we may reasonably conclude at it is to be found in all; and, if we fail to discover a stomach in many, we should rather suppose ur failure to proceed from want of skill, or from want of sufficient delicacy in our senses, arising robably from the excessive minuteness of the beings under examination. We shall, therefore, ssume that all animals possess a stomach, and that they digest; we may infer that they are all ossessed of sensation; but it is absolutely certain that they all, and they alone, permanently possess he power of voluntary motion.

If, therefore, we may venture to propose a definition which shall be generally applicable to all nimals, we should define them to be *Living Beings having stomachs*. The stomach is, in fact, the great essential spring of every animated being. Nerves and muscles, organs of sensation and motion, appear indeed to be of a higher and more elevated character than the organ of digestion. Yet would these golden wheels of animated nature be inert and motionless, if they were not influenced by this prime-mover, formed of a coarser, but more energetic material, which supplies the fuel to their fires, and enables them to maintain undiminished the original vigour of their motions.

SECT. X.—GENERAL REVIEW OF LIVING BEINGS CONTINUED.

Their Unity and Perfection—Symmetry—Mutual Dependence—Classification of Living Beings.

ALL living beings are organized; that is, they are composed of different organs, each performing its separate function, and in its own peculiar manner. These organs collectively form a whole, perfect in each being; and the aggregation of those actions compose all that we are permitted to know of Life. Without the healthy state of the body, life cannot exist; yet the organs remain after life has ceased. We behold a body, which has just been deserted by the breath of life; we perceive an exquisite machine, where nothing seems defective; the wheel-work remains entire, but it wants the propelling hand of the workman. We may admire the sublime mechanism of that mighty Being who formed it, but the moving power ever escapes our research.

The greater number of living beings possess numerous organs, and a complicated structure. When the functions are various, the structure becomes intricate; but there exists a regular gradation—a well-marked hierarchy of functions, as well as of organs. All living bodies absorb nutriment, and reproduce their species; all animals move spontaneously at least some of their parts; many visibly respire; Man thinks. But it is evident that the first order of these functions is nutrition—the other phenomena always presuppose this one. Let us, then, examine the subject of nutrition, and we shall assuredly commence at the first link in the vital chain.

The greater number of Plants have a root fixed in the earth, a stem which shoots into the air, and directs itself towards the light. This stem bears leaves, branches, and flowers; these flowers, of various degrees of complication, produce fruits or seeds, destined to form a succession of beings, similar to those which have produced them. If we desire to ascertain which of these organs is essential to the existence of the plant, and, with this view, we successively abstract these several parts; if we cut off the fruits and seeds, the remainder of the plant rests uninjured. The stalk may lose its leaves without perishing; it may be cut, and the roots will continue to live and absorb in their ordinary manner—nay, the root will often even reproduce parts similar to those of which it has been deprived. The root is, therefore, the most important part of the plant, and by it principally the whole vegetable is nourished.

Something similar to this may be observed in Animals. We see an animal of a very complicated structure. A bony skeleton, nerves, organs of sensation, a brain, muscles for motion, a heart for circulating the blood, lungs for absorbing air, a stomach in which the nutriment is deposited and prepared, glands for secreting the humours, arrangements for continuing the species, a general covering for protecting the whole, and limbs for changing its situation;—all these organs, and many more, compose its substance. In beings of this degree of complication, it is impossible to assign to each organ its proper degree of importance, because we cannot abstract any without injuring them all; and many cannot even be touched without subverting the entire fabric. But this separation, which we should in vain attempt to perform, Nature has herself realized in the long chain of animated existence. In descending from the viviparous quadrupeds to the birds, from the birds to the reptiles and fishes, and passing from the birds and fishes, by the mollusca and insects, to the worms and polypi, we see these living machines become more simple, until at length we find, in the lowest orders, nothing but that first principle indispensable to all animals. The whole body of the polypus forms, in fact, nothing but one entire stomach, without any other perceptible organ; and this alone is essential to the existence of a being so extremely simple.

We may thus conclude, that as the root is the first and essential element of the plant, so the stomach is the foundation of animal organization. Nature confirms this principle throughout all her works. She has created vegetables which are composed entirely of one vast root, and has formed animals of a simple gelatinous mass, containing only one enormous stomach. All the functions are, however, of an extreme simplicity in bodies so homogeneous. In order that a vegetable may exist, composed entirely of a root, it is necessary that the substances proper to be absorbed should surround this root; it must be attached to a soil, composed of mould, and saturated with moisture, or to another plant; and these conditions are sufficient for its individual existence. As it produces no flowers, the species can only be continued by off-sets, buds, artificial or natural divisions of the root; and it is chiefly in this way that such bodies are propagated. But that an animal—polypus or worm—composed of one entire stomach, may exist, different arrangements are requisite. The stomach is placed internally; therefore, it is evident that the food must be carried into it. The animal must be able to move towards the food, and to draw it, by certain partial movements, within the cavity. In order to seek its food, it must feel and perceive; while a certain degree of instinct must exist, that it may adopt these movements, in proportion to its wants. Thus, from one fundamental arrangement, there arises a being, perfect though simple, but which, though simplest of its kind, already appears complicated.

We have styled the polypus a simple being, because it is composed of one entire stomach. Although it moves, and must feel, we can perceive no muscles, brain, or nerves; it possesses powers, while the intruments remain concealed. Yet the polypus must be considered as a perfect being, because to it is assigned all the conditions necessary for its continued existence: it is in this respect as perfect as a bird, or as one of the Mammalia. It is true that the animal possesses neither a heart nor lungs, no vessels or glands; but it has no occasion for them. When the body is one entire stomach, and when the animal is perfectly simple and homogeneous throughout, it is evident that these structures would be superfluous. Organs are only necessary when circulation and respiration are confined to particular parts. Every portion of the animal can draw from the alimentary canal that part of the nutriment necessary for its sustenance: it can breathe and assimilate these particles into its proper substance. But when the animal is not possessed of this perfect homogeneity throughout, it then becomes necessary that it should have a proper stomach to receive the nutriment, a heart to distribute it along with the blood into all the organs, and gills or lungs to purify this nutriment by exposure to the air. Unity of action is a first principle in life; and, in the higher orders of animals, it is the heart and the lungs which produce this unity in respect to nutrition, in the same manner as the brain realizes the unity of sensation.

Organization may exist without life, as living bodies are subject to death; but whoever says *Life*, also says *Organization*. Buffon was therefore guilty of a pleonasm, when he defined animals to be—*Bodies, living and organized.*

This organization of living bodies is regulated by certain fixed rules, which have received the name of laws from their constancy and universality. We have just spoken of the perfection and unity observable in all living bodies. The latter, however, is not absolute. Animals possessing a complicated structure are in truth *individuals;* but with plants and with the lower animals individuals cannot be strictly said to exist, at least in the sense in which the term is understood in regard to Man and the higher animals. It is true that, as long as the several organs remain untouched, they enjoy one common life, and form one perfect and consistent being; but it is not impossible to abstract and prune away some parts, without interrupting the life of the being thus mutilated. We know well that a plant can be deprived of its flowers, leaves, and branches; there may remain nothing but a divided root, with a mutilated stem; and even this vestige of a living being will not cease to enjoy life. Nay, frequently many of the detached parts will themselves become new beings, when placed under circumstances favourable to their development. A branch and a leaf are sometimes adequate to form a vegetable similar, in all its parts, to the being whence they were derived. Upon this fact rest the whole theory and practice of slips and layers. The same thing is found with certain animals. A naked polypus, when cut into several pieces, forms so many new and perfect polypi, which continue to live in exactly the same manner as their original stock. Many of the rays of an Asterias, or Sea-star, may be detached without destroying the animal. The heads of slugs may be cut off, and the animals survive, even without any apparent diminution of their vigour. But what seems still more astonishing, some of the vertebrated animals themselves may be similarly mutilated without being instantly deprived of life. Tortoises and Salamanders, which have been decapitated, will still maintain their existence for a considerable time. The Emperor Commodus used to amuse himself with knocking off the heads of Ostriches while running round the Circus at Rome; and we are told by the historians of the times that they still continued their course. This singular power is even perceptible in the newly-born animals of the class Mammalia, which preserve their existence for a very short period, even when similarly injured. Still, however, these are but exceptions to a general law prevailing throughout the Mammalia, the birds, and even among animals less complex and less elevated in the scale of creation. With these we in general find, that the extirpation of any important organ is incompatible with life. Sudden death speedily follows such an operation. They are only capable of supporting the amputation of a limb or appendage; they can only indure a superficial wound or injury. There exists, among all the Vertebrated Animals, a perfect dependence among their primary organs. If one of these be taken away, the remainder of the body ceases to live. If one of them be sick or wounded, the injury affects the other parts. There are five important organs, the integrity of which is absolutely essential to the continued existence of an animal possessing them; these are the heart, the brain, the organs of respiration, the spinal marrow, and the stomach. When these are once associated in a living animal, their co-existence is indispensable; and any serious division or decapitation of a body, provided with these five organs, is speedily mortal.

The parts of a plant are less united and more independent of each other; while the destruction of a part does not lead to the annihilation of the whole, because plants are nearly homogeneous. The portions remaining are provided with the same organs as the entire being. Precisely the same cause enables those lower animals to exist, which are formed but of one simple stomach. They possess no special and circumscribed organs; each of their divided segments partakes of an equal degree of complexity with the whole. But it is evident that a different result ought to be observed among the higher animals, where the functions necessary to their existence are isolated in special and circumscribed organs. With them the existence of the *individual* rests upon the exact mutual relation of the varied pieces composing the entire body.

In fact, it is a general rule, which prevails throughout the entire Animal Kingdom, that the organs essential to life are concentrated and intimately united in an animal, according to its elevation in the scale of creation, or, in other words, according as its structure is more or less complex. The variety and intricacy of the wheel-work requires a greater concentration of the moving power.

The symmetrical forms observable in all living beings are surprising. In regard to the roots of plants, and the branches of large trees, we observe that a great irregularity generally prevails. But this is owing rather to inequalities of the soil, and to varieties in the intensity of light, than to any natural disposition to irregularity in the plants themselves. The soil is not composed of uniform materials, and the roots always direct their fibres toward those parts which are most easily moved and yield the most abundant nutriment. The leaves and buds, again, are delicately sensible to nice degrees of light. We accordingly observe that the Coniferæ, such as the Pine and Fir, being resinous and ever-green trees, upon which these powers have least influence, present the most regular and symmetrical forms.

The regular arrangement among plants is nowhere found in greater perfection than among the Labiatæ. We do not here allude to their flowers, which are not so very remarkable in this respect, but to their square stems, their opposite leaves, their branches, and their peduncles. In most of these plants, each leaf, taken separately, is arranged with regularity. But none even of those can compare with the beautiful symmetry observable in the leaves of the Sensitive Plant, the Acacias, and the Firs. In by far the greater number of plants we find the utmost exactness in the distances between the several divisions of the calyx and corolla,—the flower-cup, and the flower itself; in the dimensions of each stamen, of each pistil; in every compartment of the ovarium, and of the fruit. With the exception of certain flowers analogous to those of the Acacias, of the Labiatæ, of the Orchideæ, and some others, the irregularities which many occasionally present are due to the abortion of certain parts, to their adherence, or to their transmutation into other forms.

Ascending to the Animal Kingdom, and arriving at the Polypi, those lowest of animated beings, we already find the same symmetrical arrangements. Their cilia, their tentacula, or little arms, these appendages of mere animated sacs, are disposed with regularity, around that single orifice, which we dignify by the name of *mouth*. It is only in those calcareous and arborescent masses which they form and inhabit, and which compose by their aggregation. rocks, islands, and rudimentary continents, that we fail to observe this regular arrangement. We may recognise the same order in the starry rays of the Euryalia, and in the spinous compartments of the Echini, or Sea-urchins. In respect to insects, the symmetry is exquisite. We find the same quality in many Mollusca, but most particularly in their shells, and in the crustaceous envelops of Crabs and Lobsters.

It is, however, in the higher or Vertebrated Animals, that symmetry is brought to its greatest degree. Their bones, their nerves, their organs of sense, their brain, their muscles, their glands, their gills or lungs, are all arranged in lateral pairs, when their number is even; or they are placed in the exact central axis of the body, when their number is odd. We must admit, however, that it is externally we can best trace this correspondence, for the internal organs are not thus arranged. In this respect the contrast is altogether surprising: in vain we seek for symmetry in the disposition of the intestines, the liver, or the heart.

This physiological arrangement is ably illustrated by the excellent Dr. Paley. "The regularity of the animal structure," he observes, "is rendered remarkable by the three following considerations:—First, the limbs, *separately* taken, have not this co-relation of parts, but the contrary of it. A knife taken down the chine, cuts the human body into two parts externally equal and alike; you cannot draw a straight line which will not divide a hand, a foot, the leg, the thigh, the cheek, the eye, the ear, into two parts equal and alike. Those parts which are placed upon the middle or partition line of the body, or which traverse that line, as the nose, the tongue, the lips, may be so divided, or, more properly speaking, are double organs; but other parts cannot. This shows that the correspondency which we have been describing does not arise by any necessity in the nature of the subject; for, if necessary, it would be universal; whereas, it is observed only in the system or assemblage: it is not true of the separate parts; that is to say, it is found where it conduces to beauty or utility; it is not found where it would subsist at the expense of both. The two wings of a bird always correspond; the two sides of a feather frequently do not. In centipedes, millepedes, and the whole tribe of insects, no two legs on the same side are alike; yet there is the most exact parity between the legs opposite to one another. The next circumstance to be remarked is, that, whilst the cavities of the body are so configurated as *externally*, to exhibit the most exact correspondency of the opposite sides, the contents of these cavities have no such correspondency. A line drawn down the middle of the breast, divides the thorax into two sides exactly similar; yet these two sides enclose very different contents. The heart lies on the left side, a lobe of the lungs on the right, balancing each other neither in size nor shape. The same thing holds of the abdomen. The liver lies on the right side, without any similar viscus opposed to it on the left. The spleen indeed is situate over against the liver, but agreeing with the liver neither in bulk nor form. There is no equipollency between these. The stomach is a vessel both irregular in its shape and oblique in its position. The foldings and doublings of the intestines do not present a parity of sides. Yet that symmetry which depends upon the co-relation of the sides, is externally preserved throughout the whole trunk; and is the more remarkable in the lower part of it, as the integuments are soft; and the shape, consequently, is not, as the thorax is by its ribs, reduced by natural stays. It is evident, therefore, that the external proportion does not arise from any equality in the shape or pressure of the internal contents. What is it indeed but a correction of inequalities?—an adjustment, by mutual compensation, of anomalous forms into a regular congeries?—the effect, in a word, of artful, and, if we might be permitted so to speak, of studied collocation? Similar also to this, is a third observation; that an internal inequality in the feeding vessels is so managed, as to produce no inequality of parts which were intended to correspond. The right arm answers accurately to the left, both in size and shape; but the arterial branches, which supply the two arms, do not go off from their trunk, in a pair, in the same manner, at the same place, or at the same angle, under which want of similitude it is very difficult to conceive how the same quantity of blood should be pushed through each artery: yet the result is right;—in the two limbs which are nourished by them, we perceive no difference of supply, no effects of excess or deficiency. Concerning the difference of manner, in which the subclavian and carotid arteries, upon the different sides of the body, separate themselves from the aorta, Cheselden seems to have thought, that the advantage which the left gains by going off at an angle much more acute than the right, is made up to the right, by their going off together in one branch. It is very possible that this may be the compensating contrivance: and if it be so, how curious—how hydrostatical!"

Many animals form singular and remarkable exceptions to this general law of symmetry. The Mollusca have generally their digestive orifices, as well as the distinctive characters of sex, placed on one side of the body, and that is usually the right side. Flat fishes swim on one side; both their eyes are placed on that which is turned uppermost, and this again is almost always the right side. Even in those animals which are most beautifully arranged, one side of the entire body surpasses the other in strength, energy, and activity, and this stronger half of the body is almost always the right side. We can observe this circumstance among the Crustacea; we see it in the side-walk of the Crab; and remarkably so in the Pagurus Bernhardus, or Hermit Crab, where the right forceps is larger than the left. We even see it in the larger birds, and the feathers of the right wing are always stronger and of a better quality than those of the left. The same inequality can be traced among the Mammalia, and in none of them more so than in Man, who is, perhaps, *less* ambidextrous than any other animal. With him the superiority of the right hand over the left is not altogether the effect of habit, but is founded in nature. In walking, it is the right leg and foot that give the greater impulse to the body; in hopping or leaping, every schoolboy, who is not naturally left-handed, uses his right leg in preference to the left. Diseases of the right are more acute than those of the left side. When a person wishes to examine an object most minutely, he looks at it with one eye, and that is almost always the right eye. Whether it be not a consequence of that more general law, that a concentration of vital force in one organ is followed by a diminution of vigour in others adjacent to it, and that the presence of the heart at the left side deprives that entire division of the body of the vigour enjoyed by the right side, we shall not at present venture to determine.

We have now shown that one general plan can be traced throughout the whole of living beings; that analogies, sufficiently precise, may be observed throughout the Animal and Vegetable Kingdoms; and that in every portion of created existence, we find a degree of unity and perfection, a mutual dependence among their parts, and the most exquisite symmetry in their forms. We shall now proceed to trace the analogy perceptible in the essential functions of all these beings. Whether we examine the arrangements for the continuation of the several species, the manner in which that constant ingress and egress of particles, constituting nutrition, is fulfilled, the temperature belonging to each class of beings, or that necessity which compels every one of them to come in immediate contact with pure air, the results are the same for all. It is only the details in the workmanship of the great artificer that vary, but the same divine hand is perceptible throughout the whole. Thus, all living beings require nutriment, but animals alone receive the food into central cavities, and digest it. To all living beings air is equally essential—all absorb it and respire; but the instruments of respiration are infinitely diversified in the several classes of living beings. Man and other Mammalia, birds, and reptiles, breathe through lungs; the fishes, on the contrary, the Crustacea, and the Mollusca, respire through gills or branchiæ. Insects, again, perform this function through tracheæ, or minute holes, with which their surfaces are perforated; while many worms and polypi appear only to absorb air through the pores of their skin, with which they are everywhere covered. Plants breathe through their leaves; and many of them, deprived even of leaves, only perform this function through the pores of the epidermis which covers their substance.

Again, in respect to the arrangements for continuing the several species, we observe the same general design, while the means are ever various. How different do we see this function in the Mammalia—those viviparous animals, where the young, already active and nearly perfect, immediately commence, from the moment of their separation from the parent, those instincts and actions, which can be terminated only by death; in the numerous class of oviparous, and in the ovo-viviparous animals! Again, how immense the chasm between all these animals just alluded to, and the lower beings which are destitute of any distinctions of sex!—how different is the function performed by the Polypi, without sexes, without germs, producing their kind only by buds or off-sets! —and then, again, another mighty chasm between these and plants, continuing their species by hermaphrodite flowers, or else by flowers of distinct sexes! Nor even here does variety cease to exist, for many are cryptogamous, or apparently destitute of any means for continuing their species, except by certain minute and almost evanescent sporules or reproductive corpuscles.

In all functions we trace this analogy in the end, and diversity in the means; and nowhere in a greater degree than in the functions peculiar to animals. They all appear to feel, yet many possess no other organ of sensation than the skin. In very many we find no brain, and in others not even can a vestige of nerves be traced. It is evident that they all move spontaneously, yet in many we can find no visible marks of muscles or organs of motion. We shall, however, not enlarge much further on this point, but merely allude to the analogy observable among the Vertebrated Animals.

The analogy among the functions and organs of these animals is so remarkable, and the attention which has in consequence been paid to them so great, that we are exceedingly apt to form limited and erroneous views of the other parts of the animal world;—we expect to find in the lower animals the same parts, the same functions, which are plainly observable in them. Deeply impressed with their structure and functions, we can scarcely bring ourselves to imagine any living being without circulating fluids, a heart, blood, or vessels. So prejudiced are we in favour of the arrangements observable in the higher animals, that we can scarcely imagine any sensitive being without nerves, or any creature capable of moving without muscles. Tournefort even admitted plants to have muscles; nay, further, he actually described them. At the present day, there is little probability of our falling into a similar error; yet we are all naturally disposed, on observing a great analogy in the functions of all animals, to suppose them to be identical in their structure.

We have said that the analogy among the Vertebrated Animals is very remarkable. They are all possessed of a spinal column, composed of numerous vertebræ. Within this solid column is lodged the spinal marrow, and it carries at one extremity a well-defended bony case or head, which contains the brain. In all these beings we find a heart, red blood, lungs, or gills; in all, the organs of the five senses are seen in greater or less degrees of perfection: we find nerves, muscles, a digestive canal, more or less complicated, a liver and pancreas, with evident arrangements for continuing the species. With the exception perhaps of one species, they all have their mouths disposed horizontally; and when they have limbs, these are always four in number. This similarity prevails throughout their structure and functions. It is true that their surfaces vary remarkably according to their several destinations, while the organs of motion differ greatly as they may be designed for swimming, flying, or walking. The organs of respiration vary according as they are intended to breathe in water or in the air. But these differences in external arrangement do not prevent us from tracing the most exact analogy among them all. If we take all the organs, one by one, and compare them separately in any two vertebrated animals, we shall find the most exact equivalents in the two beings; the analogy will be found perfect in all the essential circumstances; it is only the details which are observed to differ. The fish at first sight appears to have neither neck nor thorax: but on inspecting it more attentively, we find it to be possessed of all the series of vertebræ; and that the different pieces of its thorax are concentrated near the cranium, with which they are almost confounded. M. Geoffroy has illustrated this curious organization of the Fishes in a philosophical and truly interesting manner. There is, however, one very remarkable distinction between these aquatic vertebrata and the aerial vertebrata, in the organs of voice, of which the former are completely deprived.

The principles, which must form the bases of a natural system of classification, have been already explained. A knowledge of internal organization, with the laws of the subordination and co-existence of functions, will alone lead us to this result.

Every function presupposes another function. Thus, when we see a being apparently moving voluntarily when irritated by any stimulant, we infer that it feels. We, therefore, conclude that voluntary motion presupposes sensation. Again, Life is temporary in its action: it therefore presupposes the reproduction of individuals with the extinction, and perhaps also the creation, of new species. We also conclude that circulation presupposes respiration; because, wherever we find a heart, we also meet with lungs, just in the same manner as we invariably find nerves wherever we can discover muscles. In fact, Life is but an aggregation of phenomena produced by organs connected and governed by these laws of coexistence.

But in forming a system of classification, the difficulty consists in detecting the law of subordinations existing among the various combinations of these instruments of Life. Reflection upon the final cause or design of the functions will often lead us to detect these laws; but there are innumerable relations which no discernment could detect, without the nicest dissection of the bodies, or the most arduous observation of the habits of the animals when in their native elements. The anatomist in his laboratory, and the "out-of-door" naturalist, who haunts the wilds of nature, must unite their labours before we can form a satisfactory system of classification.

After examining the internal structure of every known animal, it has been found that some of them have vertebræ, and others have none: this is a fundamental fact. Again, on examining further, it is found that all those having vertebræ are also possessed of a spinal marrow and a complicated brain; that they have always four organs of sense, of various degrees of perfection, with horizontal jaws placed in the head; and that they have never more than four limbs, and always red blood. On the contrary, when the Invertebrated animals are examined, they are never found to possess either a brain or spinal marrow; their senses are not so distinctly marked, their blood is white, or not so red, and they all have more than four limbs, or none whatever. Proceeding further, when the Vertebrated animals are more closely examined, some of them are found to continue their species by eggs—they are oviparous; others, on the contrary, produce their young alive—they are viviparous. The latter are found to be alone possessed of mammæ, for suckling their young, and hence they are called Mammalia.

Whenever, therefore, we find an animal with a bony skeleton, we know that it must either belong to the Mammalia, or to one of the three classes of oviparous Vertebrata. If it have feathers and lungs, it is a Bird; if it have lungs and no feathers, it is a Reptile; if it have gills and not lungs, it is a Fish. On looking further into the details of the structure, there are found other varieties, yet ever coexisting with certain essential differences. We are thus enabled to assign precisely the rank of an animal from knowing the smallest part of one of these essential organs; and we can even discover the most curious relations between these differences in the structure of animals, and their habits or instincts. All the Carnassiers, or beasts of prey, for example, have the digestive canal more simple, shorter, less powerful, and consequently their body more slender: on the contrary, they have the canine teeth, or parts analogous to them, much longer, stronger, better armed, and moved by muscles of great energy. Birds of prey have the nails of their claws more fitted for tearing, the beak strong and hooked. The lion, and all others of the cat genus, are similarly armed with formidable retractile claws, with alternate and sharp teeth, and with a solid jaw-bone, moved by powerful muscles. These fundamental characters are in a manner reflected throughout the whole structure, in such a manner that, upon examining a process or projection in one of the teeth of a Carnivorous quadruped, or the condyle of its jaw-bone, we can describe the remainder of its frame-work, and write the history of its habits. In the same manner, we can form an estimate of the force with which a bird flies, by examining the formation of its sternum or breast-bone, to which the muscles of the wings are attached. Whenever we find those two small bones, called Marsupial, in the pelvis of an animal, we may be certain that its young are produced before their time; that they are received and protected in a ventral pouch or bag. Finally, we know that the Ruminantia, or ruminating animals, all have a cloven hoof; that they all have four stomachs, and no incisive teeth in the upper jaw; and that all which carry antlers or horns on their front, have no canine teeth in the upper jaw. The history of the Animal Kingdom offers many facts analogous to these.

But we must remark, that all the organs of each being have the most perfect agreement among themselves. Never does Nature unite among them characters of an opposite kind; we never find the teeth and jaw-bone of the Carnassier, with the cloven foot of an herbivorous quadruped. The poets, painters, and statuaries of former times, loved to blend these distinctive characters into imaginary and fantastic forms. Deceived by their fertile imaginations, they knew not the laws regulating their coexistence. Sometimes we see enormous wings that no muscle can move; sometimes the heads of many animals of different species, united to a trunk which belongs to one of them, or perhaps to a different animal. Nature disdains to present the discordant characters of the Cerberus, Demon, or Angels of our painters and our poets. One universal harmony characterizes all her works, and every part of her perfect mechanism corresponds to the whole.

These, then, are the principles of our Classification, founded on the comparative importance of the organs, their constancy, and the laws of their subordination.

A Stomach represents the Animal Kingdom, and a Root the Vegetable Kingdom. As these can exist isolated from every other part, we must seek for other organs to form the secondary divisions in the two Kingdoms.

With Animals, we must first examine whether they are vertebrated; and in that case, whether they are viviparous or oviparous; this is, whether they have mammæ or not. If they have none, we must next inquire whether they breathe through lungs or gills; and we may further examine whether they are or are not carnivorous, whether they fly, walk, swim, or crawl.

If, on the contrary, the animals under examination be without vertebræ, we examine the general arrangement of their body, their movements, whether they breathe through branchiæ, tracheæ, or simply through the skin; whether they have one or more hearts, or none whatever; whether they have wings, feet, antennæ, or tentacula; whether they have testaceous coverings, shells, or elytra; or whether they have nerves, nervous cords, swelling into knots, or an imperfect brain; we may investigate their intestines, or their metamorphoses. In this way, we are conducted by degrees from those first great divisions, which overwhelm us by their magnitude, into the more circumscribed groups of genera and species.

THE ANIMAL KINGDOM,

CONTAINING LIVING BEINGS WITH STOMACHS, ENDOWED WITH SENSATION AND VOLUNTARY MOTION.

Divisions.		*Classes.*
I. VERTEBRATA	Animals with a bony skeleton, consisting of a cranium, spinal column, and generally also of limbs; the muscles attached to the skeleton; distinct organs of sight, hearing, smell, and taste, in the cavities of the face; never more than four limbs; sexes separate; blood always red.	1. Mammalia. 2. Aves. 3. Reptilia. 4. Pisces.

II. MOLLUSCA	Animals without a skeleton, the muscles being attached to the skin; body almost always covered with a mantle, which is either membraneous, fleshy, or secreting a shell; nervous system composed of scattered masses, or ganglions, connected by filaments; with distinct organs of digestion, circulation, and respiration; never with five senses, and generally without sight and hearing; blood white or bluish; sexes separate; hermaphrodites, perfect or reciprocal; oviparous or viviparous; eggs sometimes without shells.	1. Cephalopoda. 2. Pteropoda. 3. Gasteropoda. 4. Acephala. 5. Brachiopoda. 6. Cirrhopoda.
III. ARTICULATA	Animals without a skeleton, divided into a number of ring-like segments, having their integuments sometimes hard, sometimes soft, and the muscles always attached to the envelop; with or without limbs; respiring through tracheæ or air-vessels, sometimes through branchiæ; nervous system composed of two long cords, swelling at intervals into knots or ganglions.	1. Annelides. 2. Crustacea. 3. Arachnides. 4. Insecta.
IV. RADIATA	Animals having the organs of sensation and motion arranged around a common axis in two or more rays, or in two or more lines extending from one extremity to the other; approaching nearly to the uniform structure of plants. No circulation in vessels; nervous system obscure.	1. Echinodermata. 2. Entozoa. 3. Acalephæ. 4. Polypi. 5. Infusoria.

THE VEGETABLE KINGDOM.

CONTAINING LIVING BEINGS WITH ROOTS, WITHOUT SENSATION OR VOLUNTARY MOTION.

THE ANIMAL KINGDOM.

DIVISION I.—VERTEBRATA, SUBDIVIDED INTO FOUR CLASSES.

AMMALIA	Man and beasts, with warm blood; heart with two ventricles; females suckling their young with milk, secreted in breasts or mammæ; viviparous, excepting the Monotremata, which are either oviparous or ovo-viviparous.
VES	Birds, with warm blood; heart with two ventricles; no mammæ; oviparous; body covered with feathers, and organized for flight.
EPTILIA	Reptiles, with cold blood; heart with one ventricle; having lungs, or sometimes only gills or branchiæ; oviparous, or ovo-viviparous; generally amphibious.
ISCES	Fishes, with cold blood; heart with one ventricle; no lungs, but breathing by branchiæ; generally oviparous; body organized for swimming.

DIVISION II.—MOLLUSCA, SUBDIVIDED INTO SIX CLASSES.

EPHALOPODA	Cuttle-fishes, having the mantle furnished with a shell, and united under the body, forming a muscular sac; head connected with the mouth of the sac, and crowned with long and strong fleshy limbs, for walking on, and seizing their prey; with two large eyes; and two gills placed in the sac. Sexes separate.
TEROPODA	Marine animals without feet; with two fins, placed one on each side of the mouth; head distinct; hermaphrodites.
ASTEROPODA	Snails or Slugs, and Limpets, with a distinct head; crawling on a fleshy disc; very seldom with fins; generally with a shell; tentacula from two to six.
CEPHALA	Aquatic animals, generally with a bivalve or multivalve shell; without an apparent head or limbs; mouth concealed between the folds or in the bottom of the mantle; hermaphrodites; branchiæ external; incapable of locomotion.
RACHIOPODA	Marine animals, without a head; having two fleshy arms, furnished with numerous filaments; bivalve shells; incapable of locomotion.
IRRHOPODA	Barnacles, enclosed in a multivalve shell; with numerous articulated limbs or cirrhi, disposed in pairs; incapable of locomotion. General structure approaching to the articulated animals.

DIVISION III.—ARTICULATA, SUBDIVIDED INTO FOUR CLASSES.

NNELIDES	Worms, generally with red blood; without limbs; usually hermaphrodites, perfect or reciprocal; body soft; more or less elongated, and divided into numerous segments; circulation double, with one or more hearts or fleshy ventricles; respiring generally through branchiæ; sometimes dwelling within membraneous, horny, or calcareous tubes.
RUSTACEA	Marine animals, with a crustaceous envelop, having articulated limbs attached to the sides of the body; blood white; always with articulated antennæ or feelers in front of the head, and generally four in number; distinct organs of circulation; respiring through branchiæ.

3. Arachnides	Spiders, with the head and breast united in a single piece, and with the principal viscera situate in a distinct abdomen, behind the thorax; without antennæ; oviparous.
4. Insecta	Insects, divided into three distinct parts, the head, thorax, and abdomen; always with two antennæ, and six feet.

DIVISION IV.—RADIATA, SUBDIVIDED INTO FIVE CLASSES.

1. Echinodermata	Sea-hedgehogs, and Sea-stars, with distinct viscera and organs of respiration; with a partial circulation; often with a kind of skeleton, armed with points or moveable spines; destitute of head, eyes, and articulated feet; nervous system indistinct; organs of motion extremely imperfect.
2. Entozoa	Intestinal Worms, with no distinct organs of circulation or respiration; body generally elongated, and organs arranged longitudinally; without head, eyes, or feet.
3. Acalephæ	Medusæ, or Sea-nettles, without organs for circulation or respiration; with only one entrance to the stomach.
4. Polypi	Small Gelatinous animals, with only one entrance to the stomach, surrounded with tentacula; generally adhering together and forming compound animals.
5. Infusoria	Animalcules, or Minute Microscopic animals, found in fluids, or vegetable infusions. As their internal structure is but little known from their extreme smallness, this class will probably be found hereafter to contain animals which ought to be placed in some of the higher divisions.

SECT. XI.—GENERAL REVIEW OF LIVING BEINGS CONTINUED.

Subordination of Characters—Imaginary Chain of Beings—Circular Hypotheses.

Upon investigating the internal structure of the entire Animal Kingdom, certain beings are discovered, consisting of a stomach isolated from every other organ, without visible nerves or muscles, in detail any one of the subordinate organs, it appears to have more need of the blood than of the nerves, and that it can exist longer without the action of the brain than of the heart. But if we contemplate any part of the complicated wheelwork essential to life, it is found to be reciprocally connected, and this even in the most varied and intricate manner. Yet, when we see the heart commencing to beat before the stomach and lungs are in action,—when it is observed to throb during the absence of respiration, or after it has altogether ceased,—when we see that mutilations of the brain do not always produce instantaneous death, while the destruction of the spinal marrow speedily causes the heart to cease its movements,—we have sufficient grounds for supposing that the circulation of the blood is the primary essential condition of existence among any of the higher animals. For these reasons, in arranging the numerous subjects of the Animal Kingdom, the spinal marrow, which appears to govern the action of the heart, must be considered as the primary organ of the body; and as this delicate system of nervous matter requires for its protection a bony column of vertebræ, it is necessary to assume the existence or absence of a vertebrated column as the foundation of our primary divisions of the Animal Kingdom.

On contemplating the long chain of organized beings, we observe them to become complicated by degrees, without sudden breaks and transitions. The lowest have nothing but a simple root;—the highest possess an exceedingly complicated brain. In passing from one extreme to the other, we first find imperfect plants, or we should rather say, plants of very simple structure; some of which are composed of an umbrella-shaped covering attached to a root,—that essential organ of every plant, excepting perhaps the Krubut; others apparently consist but of simple leaves; and some have only pediculated flowers without leaves. On the other hand, we find plants composed at once of a root, leaves, stem, and flowers; while the flowers either simply present only an ovarium, stamens, and pistils—organs essential to the production of seed—or, besides these indispensable organs, they also exhibit petals and a calyx, more or less complicated.

In the Animal Kingdom, the successive gradations in the complication of structure are much more numerous. To the stomach, which we have already mentioned as composing the most simple of animals, we see added, in succession, various appendages, moveable tentacula, and afterwards some rudimentary appearances of vessels filled with white blood. Continuing our observations farther, we begin to perceive some scattered nervous filaments, and then some colourless muscular fibres. Soon after, we find that the digestive canal becomes more complicated; instead of one orifice, we now find two; at length we arrive at an elongated and convoluted intestine. In yet higher gradations than these, we perceive lungs, tracheæ, and gills, with complicated muscles, destined to move particular members, connected by joints of an elaborate mechanism. Further upwards, we perceive hearts of a simple construction, evident organs of sensation, distinct arrangements already of a complicated character, for continuing the species, ganglions or knots of nerves, with a marrow dilated at one extremity. Finally, we arrive at a vertebrated column, perfect senses, a spinal marrow enclosed in a bony tube, a skull, and, to crown the whole, a beautifully-organized brain.

However perfect this chain of animated existence may at first sight appear, we must admit that many objections may be made to its details. The transitions are often harsh, and by no means always very obvious, from one link to another; and if it be true that, whatever fractures a link,

> "Tenth or ten-thousandth breaks the chain alike,"

we fear that the advocates for one uninterrupted chain of existence, from the minutest conferva or lichen, to the throne of the Eternal, will find many chasms which cannot be united even in the most fertile imagination.

In attempting to trace this supposed chain between the lowest animals and the vertebrata, we find that the progressive development of the organs of nutrition and of sensation greatly disturb its uniformity. The organs of sensation and motion have already arrived at a great degree of perfection in animals, in which we can find no heart, no evident circulation, or observable respiration. On the contrary, in other beings, an opposite result may be observed; and while some have a heart already manifest, with vessels and complicated respiratory organs, we find that the organs of sensation have but a very slight degree of development.

If we be desirous of forming in the imagination one of these universal chains of existence, we have but to assign to the mountain rocks, or to the filaments of the asbestos, the faculty of absorbing nourishment and of growing, and we have formed the idea of a being resembling a plant, which possesses two orders of functions,—the one essential to the preservation of the individual, and the other necessary for the continuation of the species. To these two subordinate, yet well-defined functions, let us add the powers of voluntary motion and sensation,—let us add a central cavity for digesting the aliment; and we thus produce an animal of the lowest possible degree. To this moving, sensitive, and instinctive mass, let us join numerous nerves traversing every part, senses of a complex form circumscribed in special organs, a central brain, the instrument of perception and volition; let us add to these, muscles for obeying the determinations of the will, with a skeleton for affording a support to the muscles, and firmness to the whole fabric, and an animal is constructed of the highest order and of the most complicated form. On the summit of this series of superior beings, let us place Man—a being remarkable for the vertical situation of his body, the volume of his brain, the perfect adjustment of his senses; for his prudence, curiosity, and wisdom; for the energy of his will, the lights of his reason, and the sublimity of his genius.

Many philosophers, but especially Donati and Charles Bonnet, have ingeniously attempted to arrange all the bodies in nature, in a manner similar to what we have here attempted to explain, according to the progressive analogies which they offer to the observer. They have endeavoured to pass by insensible gradations from one natural production to another, just as in the rainbow or solar spectrum we arrive, by unperceived transitions, from colour to colour, from the violet ray to the blue, from the blue to the indigo, from this to the green, yellow, orange, and red, and finally, from the red, by a new circle, round again to the violet. The philosophers whom we have just named thought that every thing in nature formed one long chain, without break or interruption, and Bonnet illustrated his views in the following manner:—

He thought that the talcs, the slates, the schists, but especially the amyanthus, formed a natural and easy transition from the Mineral to the Vegetable Kingdom. Again, the sensitive plant, as well as many species of algæ and fuci, formed a natural link between plants and the most simple kinds of animals. After that, a thousand different shades and nice transitions presented themselves in the Animal Kingdom. If certain species of simple polypi form the connecting link between the two great kingdoms of organized Nature, they serve, at the same time, to unite the infusoria, those microscopic inhabitants of fluids, with the acalephæ, sea-nettles, or medusæ. Again, these last-mentioned animals conduct us gradually to the worms and mollusca, on the one hand, and, for different reasons, to the insects, the arachnides or spiders, and the crustacea, on the other. Proceeding further, we are led from the aquatic worms to the mollusca, by means of the hirudineæ or leeches, and from the mollusca to the reptiles, by the limax or snail. The reptiles, in their turn, form the bond of connexion with the fishes, by means of the tadpoles, the young of the frog, in the same manner as the insects, by another circle, merge successively into the worms, mollusca, and reptiles, by their larvæ and caterpillars. Water-serpents are not very different from eels. The fishes are related to the birds by means of the flying fish, the trigla or gurnard, and the exocetus; and, finally, the birds are linked to the mammalia by the ornithorynchus in one sense, and by the bats and flying squirrels in another.

Many analogies of a similar kind are traced by the ingenious Bonnet. Thus, the palmipedes, or web-footed birds, are said to lead us, by a gentle transition, to the fishes, just as the penguins and ostriches merge gradually into the mammalia. We are conducted from the mammalia, to the fishes by the otters and whales, to the reptiles by the seals, and to the birds by the bats and the spiny echidnæ. The transition is not abrupt, according to Bonnet, from the monkey to Man, and Man himself is formed after the image of his Creator. He adds, with his usual elegance, "Un seul être est placé hors de la chaîne, et c'est celui qui l'a créée." (One being alone is placed without the chain, and that is—THE CREATOR.)

We should not have dwelt thus at length upon these analogies, many of which are altogether imaginary, were we not fully persuaded that even these imperfect comparisons are useful in giving a general idea of living beings to persons ignorant altogether of Zoology, and consequently are appropriate for these introductory pages.

But if naturalists have failed in attempting to resolve the intricate dispositions of Nature by the straight line, they are equally at fault in proposing circular theories. In vain do they attempt the solution of problems, which even the highest geometry cannot resolve, by the simple theories of the straight line, and circle. Seduced by an excessive love of simplicity, they depart from those physiological views which should form the basis of a sound system of classification.

Mr. W. S. Macleasy was the first proposer of the circular system. He thought that the several kingdoms of Nature, as well as their various subdivisions, returned into themselves, and may therefore be represented by circles. He considered the number five as the basis of this system. Each circle formed precisely five groups; each of these composed other five, and so on, until we arrived at the extreme limit of the system. The proximate circles were thought to be connected by the intervention of lesser groups, to which the term *osculant* was assigned; and relations of analogy were pointed out between certain corresponding points in the circumferences of contiguous circles. We must admit that this theory has been applied with some degree of success to two of the branches of Natural History—Ornithology and Entomology; and the reason of this evidently arises from the great number of objects included in these branches, which gives an unusual facility to the circular theorist.

The objects of Natural History are infinite in number; that is to say, their number is so vast that no individual, however industrious, can possibly, within the usual period of a lifetime, comprehend their various phenomena and relations. Again, these phenomena themselves are innumerable; the connexion of their properties is absolutely overwhelming, by their intricacy and the closeness of their approximation. If, then, we are willing to form a circular theory, the basis of which is intended to be three, five, seven, or any other number, arbitrarily assumed, we have but to take some one leading group; and, casting about for some other leading group which can join on to this first one, and a third on to the second, we must necessarily fall in with some other leading group which will join on to the first, and thus a circle will be formed. We have said necessarily, because, according to the common theory of probabilities, the number of objects being infinite, and the number of groups, and the relations of groups, also infinite, we must necessarily, without the aid of any very fertile imagination, fall in with some leading property which will conduct us to the spot whence we started.

This capability of arrangement in circles is not exclusively a law of Nature, as the advocates of the circular theories would lead us to suppose. Works of Art may be arranged in a similar manner. The merchant may arrange his goods, or the librarian his books, in circles, according to the most approved principles. Commencing with folios bound in morocco, and passing through all the gradations of binding, size, and colour, he might be easily conducted, by these and other relations, to the unbound folio, stitched in red cloth, which would lead him, by a nice transition, back again to his original starting-place; and if any difficulty attached to this arrangement, it might easily be remedied by the invention of groups normal or aberrant.

We are apt to imagine, on falling in by accident with any of the recent works proposing circular theories, that we have mistaken treatises on Geometry or Mechanics for volumes of Natural History. Considering internal organization and laws of coexistence, as subjects irrelevant to Natural History, they substitute (what a distinguished circular theorist of the present day rightly terms) the "wheels within wheels" of a fertile imagination. They may not be unaptly compared to the Ptolemaic system of Astronomy; and like it, could only be tolerated in the infancy of science.

"With cycle on epicycle,—orb on orb,"

they almost call from us the just, though somewhat startling, observation of Alphonso X. king of Castile.

The combinations of properties among natural objects are so numerous that many beings must necessarily have the same parts, and there must always be a great number presenting very slight differences. On comparing those resembling each other, it is easy to form series, which will appear to descend gradually from a primitive type. These considerations have accordingly given rise to the formation of a scale of being, and to circular theories; the object of the former being to exhibit the whole in one series, commencing with the most complicated, and ending with the most simple organization,—and that of the latter to form two series, which, like two semicircles, described with the same radius, shall exactly fit and correspond at their extremities. In each, the mind is led from one link to another by insensible shades, almost without perceiving any interval.

On considering each organ separately, and following it through all the species of one class, we observe that its progression, within certain limits, is preserved with a singular regularity. The organ, or some vestige of it, is to be found even in species where it is no longer of any apparent use, except to prove that Nature strictly adheres to the law of doing nothing by sudden transitions. Yet, the organs do not all follow the same order of gradation. One part is found absolutely perfect in a certain animal, while another part is in its most simple form. Again, on examining a different animal, the relative complication of the two organs is absolutely reversed. If, therefore, we were to class different species according to each organ taken separately, we should be under the necessity of forming as many series as we should have regulating organs. Thus, to make a general scale of complication, it would be essential to calculate the precise effect resulting from each combination, which is far from being practicable.

As long as the great central springs remain the same, and while we confine ourselves to the same combinations of the principal organs, these gentle shades of an insensible gradation are found to prevail. All the animals of each of the primary divisions seem formed on a common plan, which serves as the basis of all their minute external modifications. But the moment that we direct our attention from one principal group to another, wherein different leading combinations take place, the scene directly changes. There is no longer any resemblance, and an interval, or marked transition, is obvious to every one. Thus, it is impossible to find in the whole Animal Kingdom any two beings which sufficiently resemble each other to serve as a link between the vertebrated and invertebrated animals.

The Creator never outsteps the bounds which he has prescribed to himself in the laws of the conditions of existence. Ever adhering to the small number of combinations that are possible, Nature seems to delight in varying the arrangement and structure of the accessory parts. There appears in them no necessity for a particular form or arrangement, while it frequently happens, that particular forms and dispositions are created without any apparent views of utility. It seems only sufficient for their existence that they should be possible, that is to say, that they do not disturb or destroy the harmony of the whole. These varieties augment in number, in proportion as we turn our attention from the leading and essential organs to those which are less important; and when we finally arrive at the external surface of the body, where the laws of external Nature require that the least essential organs, and those least liable to injury, should be placed, we find the number of varieties absolutely infinite. The labours of naturalists have not yet succeeded in tracing all their differences, and newly-discovered species are continually rising, as it were, into existence. Yet not even is a bone varied in its surfaces, in its curvatures, or in its eminences, without subjecting the other bones to corresponding variations.

BIOGRAPHICAL SKETCH

OF OLIVER GOLDSMITH.

BY WASHINGTON IRVING.

BIOGRAPHICAL SKETCH

OF OLIVER GOLDSMITH.

THERE are few writers for whom the reader feels such personal kindness as for Oliver Goldsmith, for few have so eminently possessed the magic gift of identifying themselves with their writings. We read his character in every page, and grow into familiar intimacy with him as we read. The artless benevolence that beams throughout his works; the whimsical yet amiable views of human life and human nature; the unforced humour, blended so happily with good feeling and good sense, and singularly dashed at times with a pleasing melancholy; even the very nature of his mellow, and flowing, and softly-tinted style, all seem to bespeak his moral as well as his intellectual qualities, and make us love the man at the same time that we admire the author. While the productions of writers of loftier pretension and more sounding names are suffered to moulder on our shelves, those of Goldsmith are cherished and laid in our bosoms. We do not quote them with ostentation, but they mingle with our minds, sweeten our tempers, and harmonize our thoughts; they put us in good humour with ourselves and with the world, and in so doing they make us happier and better men.

An acquaintance with the private biography of Goldsmith lets us into the secret of his gifted pages. We there discover them to be little more than transcripts of his own heart and picturings of his fortunes. There he shows himself the same kind, artless, good-humoured, excursive, sensible, whimsical, intelligent being that he appears in his writings. Scarcely an adventure or character is given in his works that may not be traced to his own parti-coloured story. Many of his most ludicrous scenes and ridiculous incidents have been drawn from his own blunders and mischances, and he seems really to have been buffeted into almost every maxim imparted by him for the instruction of his reader.*

Oliver Goldsmith was born on the 10th [29th] of November 1728, at the hamlet of Pallas, county of Longford, in Ireland. He sprung from a respectable, but by no means a thrifty stock. Some families seem to inherit kindliness and incompetency, and to hand down virtue and poverty from generation to generation. Such was the case with the Goldsmiths. "They were always," according to their own accounts, "a strange family; they rarely acted like other people; their hearts were in the right place, but their heads seemed to be doing anything but what they ought."—"They were remarkable," says another statement, "for their worth, but of no cleverness in the ways of the world." Oliver Goldsmith will be found faithfully to inherit the virtues and weaknesses of his race.

His father, the Rev. Charles Goldsmith, with hereditary improvidence, married when very young and very poor, and starved along for several years on a small country curacy and the assistance of his wife's friends. He inhabited an old, half-rustic mansion, that stood on a rising ground on a rough, lonely part of the country, overlooking a low tract occasionally flooded by the river Inny. In this house Goldsmith was born, and it was a birthplace worthy of a poet: for, by all accounts, it was haunted ground. A tradition handed down among the neighbouring peasantry states that, in after years, the house, remaining for some time untenanted, went to decay, the roof fell in, and it became so lonely and forlorn as to be a resort for the "good people" or fairies, who in Ireland are supposed to delight in old, crazy, deserted mansions for their midnight revels. All attempts to repair it were vain; the fairies battled stoutly to maintain possession. A huge misshapen hobgoblin used to bestride the house every evening with an immense pair of jack-boots, which, in his efforts at hard riding, he would thrust through the roof, kicking to pieces all the work of the preceding day. The house was therefore left to its fate, and went to ruin.

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* Some of the above remarks were introductory to a biography of Goldsmith which the author edited in Paris in 1825. That biography was not given as original, and was, in fact, a mere modification of an interesting Scottish memoir published in 1821. In the present article the author has undertaken, as a "labour of love," to collect from various sources materials for a tribute to the memory of one whose writings were the delight of his childhood, and have been a source of enjoyment to him throughout life. He has principally been indebted for his facts, however, to a recent copious work of Mr. James Prior, who has collected and collated the most minute particulars of Goldsmith's history with unwearied research and scrupulous fidelity, and given them in a voluminous form to the world.

Such is the popular tradition about Goldsmith's birthplace. About two years after his birth a change came over the circumstances of his father. By the death of his wife's uncle he succeeded to the rectory of Kilkenny West; and, abandoning the old goblin mansion, he removed to Lissoy, in the county of Westmeath, where he occupied a farm of seventy acres, situated on the skirts of the village.

This was the scene of Goldsmith's boyhood, the little world from whence he drew many of those pictures, rural and domestic, whimsical and touching, which abound throughout his works, and which appeal so eloquently both to the fancy and the heart. Lissoy is confidently cited as the original of his "Auburn" in the "Deserted Village;" his father's establishment, a mixture of farm and parsonage, furnished hints, it is said, for the rural economy of the Vicar of Wakefield; and his father himself, with his learned simplicity, his guileless wisdom, his amiable piety, and utter ignorance of the world, has been exquisitely portrayed in the worthy Dr. Primrose. Let us pause for a moment, and draw from Goldsmith's writings one or two of those pictures which, under feigned names, represent his father and his family, and the happy fireside of his childish days.

"My father," says the 'Man in Black,' who, in some respects, is a counterpart of Goldsmith himself, "my father, the younger son of a good family, was possessed of a small living in the church. His education was above his fortune, and his generosity greater than his education. Poor as he was, he had his flatterers poorer than himself: for every dinner he gave them, they returned him an equivalent in praise; and this was all he wanted. The same ambition that actuates a monarch at the head of his army, influenced my father at the head of his table: he told the story of the ivy-tree, and that was laughed at; he repeated the jest of the two scholars and one pair of breeches, and the company laughed at that; but the story of Taffy in the sedan-chair was sure to set the table in a roar. Thus his pleasure increased in proportion to the pleasure he gave; he loved all the world, and he fancied all the world loved him.

"As his fortune was but small, he lived up to the very extent of it: he had no intention of leaving his children money, for that was dross; he resolved they should have learning, for learning, he used to observe, was better than silver
or gold. For this purpose he undertoo
struct us himself, and took as much care
our morals as to improve our underst
We were told that universal benevole
what first cemented society: we were ta
consider all the wants of mankind as ou
to regard the *human face divine* with a
and esteem; he wound us up to be m
chines of pity, and rendered us incap
withstanding the slightest impulse mad
by real or fictitious distress. In a word,
perfectly instructed in the art of givin
thousands before we were taught the n
qualifications of getting a farthing."

In the Deserted Village we have anot
ture of his father and his father's firesid

> "His house was known to all the vagrant train,
> He chid their wanderings, but relieved their pa
> The long-remember'd beggar was his guest,
> Whose beard, descending, swept his aged breas
> The ruin'd spendthrift, now no longer proud,
> Claim'd kindred there, and had his claims allo
> The broken soldier, kindly bade to stay,
> Sat by his fire, and talk'd the night away;
> Wept o'er his wounds, or tales of sorrow done,
> Shoulder'd his crutch, and show'd how fields w
> Pleased with his guests, the good man learn'd t
> And quite forgot their vices in their woe;
> Careless their merits or their faults to scan,
> His pity gave ere charity began."

The family of the worthy pastor con
five sons and three daughters. Henry,
est, was the good man's pride and hope,
tasked his slender means to the utmost
cating him for a learned and distingui
reer. Oliver was the second son, an
years younger than Henry, who was t
and protector of his childhood, and t
he was tenderly attached throughout lif

Oliver's education began when he w
three years old; that is to say, he was
under the wings of one of those good o
erly dames, found in every village, w
together the whole callow brood of th
bourhood, to teach them their letters a
them out of harm's way. Mistress E
Delap, for that was her name, flourishe
capacity for upward of fifty years, and it
pride and boast of her declining day
nearly ninety years of age, that she was
that had put a book (doubtless a hornbo
Goldsmith's hands. Apparently he did n
profit by it, for she confessed he was on
dullest boys she had ever dealt with, i
that she had sometimes doubted wheth
possible to make any thing of him: a
case with imaginative children, who ar
be beguiled from the dry abstractions
mentary study by the picturings of the

At six years of age he passed into th
of the village schoolmaster, one Thoma
he was commonly and irreverently nam
dy) Byrne, a capital tutor for a poet.
been educated for a pedagogue, but had
in the army, served abroad during the

Queen Anne's time, and risen to the rank of quartermaster of a regiment in Spain. At the return of peace, having no longer exercise for the sword, he resumed the ferule, and drilled the urchin populace of Lissoy. Goldsmith is supposed to have had him and his school in view in the following sketch in the Deserted Village :

> "Beside yon straggling fence that skirts the way,
> With blossom'd furze unprofitably gay,
> There, in his noisy mansion skill'd to rule,
> The village master taught his little school ;
> A man severe he was, and stern to view,
> I knew him well, and every truant knew ;
> Well had the boding tremblers learned to trace
> The day's disasters in his morning face ;
> Full well they laugh'd with counterfeited glee
> At all his jokes, for many a joke had he ;
> Full well the busy whisper circling round,
> Conveyed the dismal tidings when he frown'd :
> Yet he was kind, or, if severe in aught,
> The love he bore to learning was in fault ;
> The village all declared how much he knew,
> 'Twas certain he could write and cipher too ;
> Lands he could measure, terms and tides presage,
> And e'en the story ran that he could guage :
> In arguing, too, the parson own'd his skill,
> For, e'en though vanquish'd, he could argue still ;
> While words of learned length and thundering sound
> Amazed the gazing rustics ranged around—
> And still they gazed, and still the wonder grew,
> That one small head could carry all he knew."

There are certain whimsical traits in the character of Byrne not given in the foregoing sketch. He was fond of talking of his vagabond wanderings in foreign lands, and had brought with him from the wars a world of campaigning stories, of which he was generally the hero, and which he would deal forth to his wondering scholars when he ought to have been teaching them their lessons. These travellers' tales had a powerful effect upon the vivid imagination of Goldsmith, and awakened an unconquerable passion for wandering and seeking adventure.

Byrne was, moreover, of a romantic vein, and exceedingly superstitious. He was deeply versed in the fairy superstitions which abound in Ireland, all which he professed implicitly to believe. Under his tuition Goldsmith soon became almost as great a proficient in fairy lore. From this branch of good-for-nothing knowledge, his studies, by an easy transition, extended to the histories of robbers, pirates, smugglers, and the whole race of Irish rogues and rapparees. Everything, in short, that savoured of romance, fable, and adventure, was congenial to his poetic mind, and took instant root there ; but the slow plants of useful knowledge were apt to be overrun, if not choked, by the weeds of his quick imagination.

Another trait of his motley preceptor Byrne was a disposition to dabble in poetry, and this likewise was caught by his pupil. Before he was eight years old Goldsmith had contracted a habit of scribbling verses on small scraps of paper, which in a little while he would throw into the fire. A few of these sybilline leaves, however, were rescued from the flames and conveyed to his mother. The good woman read them with a mother's delight, and saw at once that her son was a genius and a poet. From that time she beset her husband with solicitations to give the boy an education suitable to his talents. The worthy man was already straitened by the costs of instruction of his eldest son Henry, and had intended to bring his second son up to a trade ; but the mother would listen to no such thing : as usual, her influence prevailed, and Oliver, instead of being instructed in some humble, but cheerful and gainful handicraft, was devoted to poverty and the Muse.

A severe attack of the smallpox caused him to be taken from under the care of his story-telling preceptor, Byrne. His malady had nearly proved fatal, and his face remained pitted throughout life. On his recovery he was placed under the charge of the Rev. Mr. Griffin, schoolmaster of Elphin, in Roscommon, and became an inmate in the house of his uncle, John Goldsmith, Esq., of Ballyoughter, in that vicinity. He now entered upon studies of a higher order, but without making any uncommon progress. Still a careless, easy facility of disposition, an amusing eccentricity of manners, and a vein of quiet and peculiar humour, rendered him a general favourite, and a trifling incident soon induced his uncle's family to concur in his mother's opinion of his genius.

A number of young folks had assembled at his uncle's to dance. One of the company, named Cummings, played on the violin. In the course of the evening Oliver undertook a hornpipe. His short and clumsy figure, and his face pitted and discoloured with the smallpox, rendered him a ludicrous figure in the eyes of the musician, who made merry at his expense, dubbing him his little Æsop. Goldsmith was nettled by the jest, and, stopping short in the hornpipe, exclaimed,

> "Our herald hath proclaimed this saying,
> See Æsop dancing, and his monkey playing."

The repartee was thought wonderful for a boy of nine years old, and Oliver became forthwith the wit and the bright genius of the family. It was thought a pity he should not receive the same advantage with his elder brother Henry, who had been sent to the University ; and, as his father's circumstances would not afford it, several of his relatives, spurred on by the representations of his mother, agreed to contribute towards the expense. One of the foremost of them was his uncle, the Rev. Thomas Contarine, who had married a sister of his father, and who continued through life one of Goldsmith's most active, uniform, and generous friends.

Oliver was now transferred to schools of a higher order, to prepare him for the University ; first to one at Athlone, kept by the Rev. Mr. Campbell, and, at the end of two years, to one at Edgeworthstown, under the superintendence of the Rev. Patrick Hughes.

Even at these schools his proficiency does not appear to have been very brilliant. He was indolent and careless, however, rather than dull, and, on the whole, appears to have been well thought of by his teachers. In his studies he inclined towards the Latin poets and historians; relished Ovid and Horace, and delighted in Livy. He exercised himself with pleasure in reading and translating Tacitus, and was brought to pay attention to style in his compositions by reproof from his brother Henry, to whom he had written brief and confused letters, and who told him in reply, that if he had but little to say, to endeavour to say that little well.

The career of his brother Henry at the University was enough to stimulate him to exertion. He seemed to be realizing all his father's hopes, and was winning collegiate honours that the good man considered indicative of his future success in life.

In the meanwhile, Oliver, if not distinguished among his teachers, was popular among his schoolmates. He had thoughtless generosity extremely captivating to young hearts: his temper was quick and sensitive, and easily offended; but his anger was momentary, and it was impossible for him to harbour resentment. He was the leader of all boyish sports and athletic amusements, especially ball-playing, and he was foremost in all mischievous pranks. Many years afterward, an old man, one Jack Fitzsimmons, one of the directors of the sports and keeper of the ball-court at Ballymahon, used to boast of having been schoolmate of "Noll Goldsmith," as he called him, and would dwell with vainglory on one of their exploits, in robbing the orchard of Tirlicken, an old family residence of Lord Annaly. The exploit, however, had nearly involved disastrous consequences; for the crew of juvenile depredators were captured, like Shakspeare and his deer-stealing colleagues; and nothing but the respectability of Goldsmith's connexions saved him from the punishment that would have awaited more plebeian delinquents.

An amusing incident is related as occurring in Goldsmith's last journey homeward from Edgeworthstown. His father's house was about twenty miles distant; the road lay through a rough country, impassable for carriages. Goldsmith procured a horse for the journey, and a friend furnished him with a guinea for travelling expenses. He was but a stripling of sixteen, and being thus suddenly mounted on horseback, with money in his pocket, it is no wonder that his head was turned. He determined to play the man, and to spend his money in independent traveller's style. Accordingly, instead of pushing directly for home, he halted for the night at the little town of Ardagh, and, accosting the first person he met, inquired, with somewhat of a consequential air, for the best house in the place. Unluckily, the person he had accosted was one Kelly, a notorious wag, who was quartered in the family of one Mr. Featherstone, a gentleman of fortune. Amused with the self-consequence of the stripling, and willing to play off a practical joke at his expense, he directed him to what was literally "the best house in the place," namely, the family mansion of Mr. Featherstone. Goldsmith accordingly rode up to what he supposed to be an inn, ordered his horse to be taken to the stable, walked into the parlour, seated himself by the fire, and demanded what he could have for supper. On ordinary occasions he was diffident and even awkward in his manners, but here he was "at ease in his inn," and felt called upon to show his manhood and enact the experienced traveller. His person was by no means calculated to play off his pretensions, for he was short and thick, with a pockmarked face, and an air and carriage by no means of a distinguished cast. The owner of the house, however, soon discovered his whimsical mistake, and, being a man of humour, determined to indulge it, especially as he accidentally learned that his intruding guest was the son of an old acquaintance.

Accordingly, Goldsmith was "fooled to the top of his bent," and permitted to have full sway throughout the evening. Never was schoolboy more elated. When supper was served, he most condescendingly insisted that the landlord, his wife and daughter, should partake, and ordered a bottle of wine to crown the repast and benefit the house. His last flourish was on going to bed, when he gave especial orders to have a hot cake at breakfast. His confusion and dismay, on discovering the next morning that he had been swaggering in this free and easy way in the house of a private gentleman, may be readily conceived. True to his habit of turning the events of his life to literary account, we find this chapter of ludicrous blunders and cross purposes dramatized many years afterward in his admirable comedy of "She Stoops to Conquer, or the Mistakes of a Night."

While Oliver was making his way somewhat negligently through the schools, his elder brother Henry was rejoicing his father's heart by his career at the University. He soon distinguished himself at the examinations, and obtained a scholarship in 1743. This is a collegiate distinction which serves as a stepping-stone in any of the learned professions, and which leads to advancement in the University should the individual choose to remain there. His father now trusted that he would push forward for that comfortable provision, a fellowship, and from thence to higher dignities and emoluments. Henry, however, had the improvidence or the "unworldliness" of his race: returning to the country during the succeeding vacation, he married for love, relinquished, of course, all his collegiate prospects and advantages, set up a school in his father's neighbourhood, and buried his talents and acquirements for the remainder of his life in a curacy of forty pounds a-year.

Another matrimonial event occurred not long afterward in the Goldsmith family, to disturb the equanimity of its worthy head. This was the clandestine marriage of his daughter Catharine with a young gentleman of the name of Hodson, who had been confided to the care of her brother Henry to complete his studies. As the youth was of wealthy parentage, it was thought a lucky match for the Goldsmith family; but the tidings of the event stung the bride's father to the soul. Proud of his integrity, and jealous of that good name which was his chief possession, he saw himself and his family subjected to the degrading suspicion of having abused a trust reposed in them to promote a mercenary match. In the first transports of his feelings, he is said to have uttered a wish that his daughter might never have a child to bring like shame and sorrow on her head. The hasty wish, so contrary to the usual benignity of the man, was recalled and repented of almost as soon as uttered; but it was considered baleful in its effects by the superstitious neighbourhood; for, though his daughter bore three children, they all died before her.

A more effectual measure was taken by Mr. Goldsmith to ward off the apprehended imputation, but one which imposed a heavy burden on his family. This was to furnish a marriage-portion of four hundred pounds, that his daughter might not be said to have entered her husband's family empty-handed. To raise the sum in cash was impossible; but he assigned to Mr. Hodson his little farm and the income of his tithes until the marriage-portion should be paid. In the meantime, as his living did not amount to £200 per annum, he had to practise the strictest economy to pay off gradually this heavy tax incurred by his nice sense of honour.

The first of his family to feel the effects of this economy was Oliver. The time had now arrived for him to be sent to the University; and, accordingly, on the 11th June, 1747, when sixteen years of age, he entered Trinity College, Dublin; but his father was no longer able to place him there as a pensioner, as he had done his eldest son Henry; he was obliged, therefore, to enter him as a sizer, or "poor scholar."

A student of this class is taught and boarded gratuitously, and has to pay but a very small sum for his room. It is expected, in return for these advantages, that he will be a diligent student, and render himself useful in a variety of ways. In Trinity College, at the time of Goldsmith's admission, several derogatory, and, indeed, menial offices were exacted from the sizer, as if the college sought to indemnify itself for conferring benefits by inflicting indignities. He was obliged to sweep part of the courts in the morning; to carry up the dishes from the kitchen to the fellows' table, and to wait in the hall until that body had dined. His very dress marked the inferiority of the "poor student" to his happier classmates. It was a black gown of coarse stuff without sleeves, and a plain black cloth cap without a tassel. We can conceive nothing more odious and ill judged than these distinctions, which attached the idea of degradation to poverty, and placed the indigent youth of merit below the worthless minion of fortune. They were calculated to wound and irritate the noble mind, and to render the base baser.

Indeed, the galling effect of these servile tasks upon youths of proud spirits and quick sensibilities became at length too notorious to be disregarded. About fifty years since, on a Trinity Sunday, a number of persons were assembled to witness the college ceremonies; and as a sizer was carrying up a dish of meat to the fellows' table, a burly citizen in the crowd made some sneering observation on the servility of his office. Stung to the quick, the high-spirited youth instantly flung the dish and its contents at the head of the sneerer. The sizer was sharply reprimanded for this outbreak of wounded pride, but the degrading task was from that day forward very properly consigned to menial hands.

It was with the utmost repugnance that Goldsmith entered college in this capacity. His shy and sensitive nature was affected by the inferior station he was doomed to hold among his gay and opulent fellow-students, and he became, at times, moody and despondent. A recollection of these early mortifications induced him, in after years, most strongly to dissuade his brother Henry, the clergyman, from sending a son to college on a like footing. "If he has ambition, strong passions, and an exquisite sensibility of contempt, do not send him there, unless you have no other trade for him except your own."

To add to his annoyances, the fellow of the college who had the peculiar control of his studies, the Rev. Theaker Wilder, was a man of violent and capricious temper, and of diametrically opposite tastes. The tutor was devoted to the exact sciences; Goldsmith was for the classics. Wilder endeavoured to force his favourite studies upon the student; the effect was to aggravate a passive distaste into a positive aversion. Goldsmith was loud in expressing his contempt for mathematics, and his dislike of ethics and logic; and the prejudices thus imbibed continued through life. Mathematics he always pronounced a science to which the meanest intellects were competent.

A truer cause of this distaste for the severer studies may probably be found in his natural indolence and his love of convivial pleasures. He sang a good song, was a boon companion, and could not resist any temptation to social enjoyment. He endeavoured to persuade himself that learning and dulness went hand in hand, and that genius was not to be put in harness. Even in riper years, when the consciousness of his own deficiencies ought to have convinced him of the importance of early study, he speaks slightingly of college honours.

"A lad," says he, "whose passions are not strong enough in youth to mislead him from that path of science which his tutors, and not his inclination, have chalked out, by four or five years' perseverance, will probably obtain every advantage and honour his college can bestow. I would compare the man whose youth has been thus passed in the tranquillity of dispassionate prudence, to liquors that never ferment, and, consequently, continue always muddy."

The death of his worthy father, which took place early in 1747, rendered Goldsmith's situation at college extremely irksome. His mother was left with little more than the means of providing for the wants of her household, and was unable to furnish him any remittances. He would have been compelled, therefore, to have left college, had it not been for the occasional contributions of friends, the foremost among whom was his generous and warm-hearted uncle Contarine. Still these supplies were so scanty and precarious, that in the intervals between them he was more than once obliged to raise funds for his immediate wants by pawning his books. At times he sunk into despondency, but he had what he termed "a knack at hoping," which soon buoyed him up again. He began now to resort to his poetical vein as a source of profit, scribbling street-ballads, which he privately sold for five shillings each at a shop which dealt in such small wares of literature. He felt an author's affection for these unowned bantlings, and we are told that he would stroll privately through the streets at night to hear them sung, listening to the comments and criticisms of bystanders, and observing the degree of applause which each received.

Edmund Burke was a fellow-student with Goldsmith at the college. Neither the statesman nor the poet gave promise of their future celebrity, though Burke certainly surpassed his contemporary in industry and application, and evinced more disposition for self-improvement, associating himself with a number of his fellow-students in a debating club, in which they discussed literary topics, and exercised themselves in composition.

Goldsmith may likewise have belonged to this association, but his propensity was rather to mingle with the gay and thoughtless. On one occasion we find him implicated in an affair that came nigh producing his expulsion. A report was brought to college that a scholar was in the hands of the bailiffs. This was an insult in which every gownsman felt himself involved. A number of the scholars flew to arms, and sallied forth to battle, headed by a hare-brained fellow nicknamed Gallows Walsh, noted for his aptness at mischief and fondness for a riot. The stronghold of the bailiff was carried by storm, the scholar set at liberty, and the delinquent catchpole borne off captive to the college, where, having no pump to put him under, they satisfied the demands of collegiate law by ducking him in an old cistern.

Flushed with this signal victory, Gallows Walsh now harangued his followers, and proposed to break open Newgate and effect a general jail delivery. He was answered by shouts of concurrence, and away went the throng of madcap youngsters, fully bent upon putting an end to the tyranny of law. They were joined by the mob of the city, and made an attack upon the prison with true Irish precipitation and thoughtlessness, never having provided themselves with cannon to batter its stone-walls. A few shots from the prison brought them to their senses, and they beat a hasty retreat, two of the townsmen being killed and several wounded.

A severe scrutiny of this affair took place at the University. Four students who had been ringleaders, were expelled; four others, who had been prominent in the affray, were publicly admonished; among the latter was the unlucky Goldsmith.

To make up for this disgrace, he gained, within a month afterward, one of the minor prizes of the college. It is true it was one of the very smallest, amounting in pecuniary value to but thirty shillings, but it was the first distinction he had gained in his whole collegiate career. This turn of success and sudden influx of wealth proved too much for the head of our poor student. He forthwith gave a supper and dance at his chamber to a number of young persons of both sexes from the city, in direct violation of college rules. The unwonted sound of the fiddle reached the ears of the implacable Wilder. He rushed to the scene of unhallowed festivity, inflicted corporal punishment on the "father of the feast," and turned his astonished guests neck and heels out of doors.

This filled the measure of poor Goldsmith's humiliations; he felt degraded both within college and without. He dreaded the ridicule of his fellow-students for the ludicrous termination of his orgie, and he was ashamed to meet his city acquaintances after the degrading chastisement he had received in their presence, and after their own ignominious expulsion. Above all, he felt it impossible to submit any longer to the insulting tyranny of Wilder; he determined, therefore, to leave, not merely the college, but also his native land, and to bury what he conceived to be his irretrievable disgrace in some distant country. He accordingly sold his books and clothes, and sallied forth from the college walls, intending to embark at Cork for—he scarce knew where—America, or any other part beyond sea. With his usual heedless imprudence, however, he loitered about Dublin until his finances were reduced to a shilling; with this amount of specie he set out on his journey.

For three whole days he subsisted on his shilling; when that was spent, he parted with some of his clothes from his back, until, reduced almost to nakedness, he was four-and-twenty hours without food, insomuch that he declared a handful of gray pease, given to him by a girl

ce, was one of the most delicious repasts
ever tasted. Hunger, fatigue, and desti-
rought down his spirit and calmed his
Fain would he have retraced his steps,
e have done so with any salvo for the
gs of his pride. In his extremity he con-
his brother Henry information of his
and of the rash project on which he had
His affectionate brother hastened to his
urnished him with money and clothes;
his feelings with gentle counsel; pre-
pon him to return to college, and effected
ferent reconciliation between him and

this irregular sally upon life he remained
wo years longer at the University, giving
f talent in occasional translations from
sics, for one of which he received a pre-
warded only to those who are the first in
merit. Still he never made much figure
ge, his natural disinclination to study
creased by the harsh treatment he con-
o experience from his tutor.

g the anecdotes told of him while at
is one indicative of that prompt, but
less and often whimsical benevolence
hroughout life formed one of the most
g yet eccentric points of his character.
engaged to breakfast one day with a col-
mate, but failed to make his appearance.
ad repaired to his room, knocked at the
d was bidden to enter. To his surprise,
l Goldsmith in his bed, immersed to his
feathers. A serio-comic story explained
umstance. In the course of the preced-
ning's stroll he had met with a woman
e children, who implored his charity.
band was in the hospital; she was just
e country, a stranger, and destitute,
food or shelter for her helpless offspring.
s too much for the kind heart of Gold-
He was almost as poor as herself, it is
d had no money in his pocket; but he
her to the college gate, gave her the
from his bed to cover her little brood,
t of his clothes for her to sell and pur-
od; and, finding himself cold during the
d cut open his bed and buried himself
he feathers.

gth, on the 27th of February, 1749, O.
s admitted to the degree of Bachelor of
d took his final leave of the University.
freed from college rule, that emancipa-
rdently coveted by the thoughtless stu-
d which too generally launches him amid
s, the hardships, and vicissitudes of life.
h returned to his friends, no longer the
to sport away the happy interval of va-
ut the anxious man, who is henceforth
for himself, and make his way through
d. In fact, he had no legitimate home
n to. At the death of his father, the
house at Lissoy, in which Goldsmith had passed his childhood, had been taken by Mr. Hodson, who had married his sister Catharine. His mother had removed to Ballymahon, where she occupied a small house, and had to practise the severest frugality. His elder brother Henry served the curacy and taught the school of his late father's parish, and lived in narrow circumstances at Goldsmith's birthplace, the old goblin-house at Pallas.

None of his relatives were in circumstances to aid him with anything more than a temporary home, and the aspect of every one seemed somewhat changed. In fact, his career at college had disappointed his friends, and they began to doubt his being the great genius they had fancied him. He whimsically alludes to this circumstance in that piece of autobiography, "The Man in Black," in the "Citizen of the World."

"The first opportunity my father had of finding his expectations disappointed was in the middling figure I made at the University: he had flattered himself that he should soon see me rising into the foremost rank in literary reputation, but was mortified to find me utterly unnoticed and unknown. His disappointment might have been partly ascribed to his having overrated my talents, and partly to my dislike of mathematical reasonings at a time when my imagination and memory, yet unsatisfied, were more eager after new objects than desirous of reasoning upon those I knew. This, however, did not please my tutors, who observed, indeed, that I was a little dull, but at the same time allowed that I seemed to be very good-natured, and had no harm in me."*

The only one of his relatives who did not appear to lose faith in him was his uncle Contarine. "This kind and considerate man," it is said, "saw in him a warmth of heart requiring some skill to direct, and a latent genius that wanted time to mature, and these impressions none of his subsequent follies and irregularities wholly obliterated." His purse and affection, therefore, as well as his house, were now open to him, and he became his chief counsellor and director after his father's death.

For about two years Goldsmith led a loitering, unsettled life among his friends, undetermined how to shape his course, and waiting with the vague hope, common to reckless and improvident men, that "something or other would turn up." Sometimes he was at Lissoy, participating with thoughtless enjoyment in the rural sports and occupations of his brother-in-law, Mr. Hodson; sometimes he was with his brother Henry, at the old goblin mansion of Pallas, assisting him occasionally in his school. The early marriage and unambitious retirement of Henry, though so subversive of the fond plans of his father, had proved happy in their results. He was already surrounded by a blooming family; he was contented with his lot, beloved by his parishioners, and lived in the daily practice of all the amiable virtues, and the immediate enjoyment of their reward. Of the tender affection inspired in the breast of Goldsmith by the constant kindness of this excellent brother, and of the longing recollection with which, in the lonely wanderings of after years, he looked back upon this scene of domestic felicity, we have a touching instance in the well-known opening to his poem of "The Traveller."

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* Citizen of the World, Letter xxvii.

> "Remote, unfriended, melancholy, slow,
> Or by the lazy Scheld or wandering Po;
> * * * * * *
> Where'er I roam, whatever realms to see,
> My heart untravell'd fondly turns to thee;
> Still to my brother turns with ceaseless pain,
> And drags at each remove a lengthening chain
>
> Eternal blessings crown my earliest friend,
> And round his dwelling guardian saints attend;
> Bless'd be that spot, where cheerful guests retire
> To pause from toil, and trim their evening fire;
> Bless'd that abode, where want and pain repair,
> And every stranger finds a ready chair:
> Bless'd be those feasts with simple plenty crown'd,
> Where all the ruddy family around
> Laugh at the jests or pranks that never fail,
> Or sigh with pity at some mournful tale;
> Or press the bashful stranger to his food,
> And learn the luxury of doing good."

During this loitering life Goldsmith pursued no study, but rather amused himself with miscellaneous reading; such as biography, travels, poetry, novels, plays—everything, in short, that administered to the imagination. His love of convivial society also led him frequently to the inn at Ballymahon, a resort of the rustic gentry of the vicinity. Here he became the oracle and prime wit of a country club, astonished his unlettered associates by his learning, delighted them with his poetry, and was considered capital at a song or a story. From the rustic conviviality of the inn at Ballymahon, and the figure he cut there, it is surmised that he took some hints in after life for his picturing of Tony Lumpkin lording it among his uncouth associates.

In company with one of the small gentry of the neighbourhood, he used to make excursions on foot, sometimes shooting, sometimes fishing or hunting the otter in the river Inny, sometimes strolling along its banks and playing on the flute. Among other of his rustic accomplishments, he became adroit at throwing the sledge, a favourite feat of activity and strength in Ireland.

Notwithstanding all these accomplishments and this rural popularity, his friends began to shake their heads and shrug their shoulders when they spoke of him, and his brother Henry noted with anything but satisfaction his frequent visits to the club at Ballymahon. It was determined that it was high time for him to strike out some course of life; and his uncle Contarine, and others of his relatives, urged him to prepare for holy orders. Goldsmith had a settled repugnance to a clerical life. This has been ascribed by some to conscientious scruples, not considering himself of a temper and frame of mind for such a sacred office; others attributed it to his roving propensities, and his desire to visit foreign countries; he himself gives a whimsical objection in his biography of the "Man in Black:" "to be obliged to wear a long wig when I liked a short one, or a black coat when I generally dressed in brown, I thought was such a restraint upon my liberty that I absolutely rejected the proposal."

Whimsical as it may seem, dress did in fact form an obstacle to his entrance into the church. Throughout life he had a passion for arraying his sturdy but somewhat awkward little person in gay colours; and when, in compliance with the persuasions of his uncle Contarine, he at length presented himself before the Bishop of Elphin for ordination, he appeared luminously arrayed in scarlet breeches! He was rejected by the bishop; some say for want of sufficient studious preparation; others from accounts which had reached the bishop of his irregularities at college; but others shrewdly suspect that the scarlet breeches was the fundamental objection.

Through the influence of his uncle Contarine he was now received as tutor in the family of a gentleman of the neighbourhood, where he remained about a year. The situation was not to his taste: there was a dependence, and a degree of servility in it that his spirit could not brook; add to this, he had received his salary, had more money in his pocket than he had ever earned before, and now his wandering propensity and his desire to see the world got the upper hand. Whatever was the real motive, he suddenly relinquished his charge, procured a good horse, and with thirty pounds in his pocket, made his second sally into the world.

The worthy niece and housekeeper of the hero of La Mancha could not have been more surprised and dismayed at one of the Don's clandestine expeditions, than were the mother and friends of Goldsmith when they heard of his mysterious departure. Weeks elapsed, and nothing was seen or heard of him. It was feared that he had left the country on one of his wandering freaks, and his poor mother was reduced almost to despair, when one day he arrived at her door almost as forlorn in plight as the prodigal son. Of his thirty pounds not a shilling was left; and, instead of the goodly steed on which he had issued forth on his errantry, he was mounted on a sorry little pony which he had nicknamed Fiddle-back. As soon as his mother was well assured of his safety, she rated him soundly for his inconsiderate conduct. His brothers and sisters, who were tenderly attached to him, interfered, and succeeded in mollifying her ire; and whatever lurking anger the good dame might have, was no doubt effectually vanquished by the following whimsical narrative which he drew up of his adventures.

"My dear Mother,

"If you will sit down and calmly listen to what I say, you shall be fully resolved in every one of those many questions you have asked me. I went to Cork and converted my horse, which you prize so much higher than Fiddle-back, into cash, took my passage in a ship bound for America, and, at the same time, paid the captain for my freight and all the other expenses of my voyage. But it so happened that the wind did not answer for three weeks; and you know, mother, that I could not command the elements. My misfortune was, that, when the wind served, I happened to be with a party in the country, and my friend the captain never inquired after me, but set sail with as much indifference as if I had been on board. The remainder of my time I employed in the city and its environs, viewing every thing curious, and you know no one can starve while he has money in his pocket.

"Reduced, however, to my last two guineas, I began to think of my dear mother and friends whom I had left behind me, and so bought that generous beast Fiddle-back, and bade adieu to Cork with only five shillings in my pocket. This, to be sure, was but a scanty allowance for man and horse towards a journey of above a hundred miles; but I did not despair, for I knew I must find friends on the road.

"I recollected particularly an old and faithful acquaintance I made at college, who had often and earnestly pressed me to spend a summer with him, and he lived but eight miles from Cork. This circumstance of vicinity he would expatiate on to me with peculiar emphasis. 'We shall,' says he, 'enjoy the delights of both city and country, and you shall command my stable and my purse.'

"However, upon the way I met a poor woman all in tears, who told me her husband had been arrested for a debt he was not able to pay, and that his eight children must now starve, bereaved as they were of his industry, which had been their only support. I thought myself at home, being not far from my good friend's house, and therefore parted with a moiety of all my store; and pray, mother, ought I not to have given her the other half-crown, for what she got would be of little use to her? However, I soon arrived at the mansion of my affectionate friend, guarded by the vigilance of a huge mastiff, who flew at me and would have torn me to pieces but for the assistance of a woman, whose countenance was not less grim than that of the dog; yet she with great humanity relieved me from the jaws of this Cerberus, and was prevailed on to carry up my name to her master.

"Without suffering me to wait long, my old friend, who was then recovering from a severe fit of sickness, came down in his nightcap, nightgown, and slippers, and embraced me with the most cordial welcome, showed me in, and, after giving me a history of his indisposition, assured me that he considered himself peculiarly fortunate in having under his roof the man he most loved on the earth, and whose stay with him must, above all things, contribute to perfect his recovery. I now repented sorely I had not given the poor woman the other half-crown, as I thought all my bills of humanity would be punctually answered by this worthy man. I revealed to him my whole soul; I opened to him all my distresses; and freely owned that I had but one half-crown in my pocket; but that now, like a ship after weathering out the storm, I considered myself secure in a safe and hospitable harbour. He made no answer, but walked about the room, rubbing his hands as one in deep study. This I imputed to the sympathetic feelings of a tender heart, which increased my esteem for him, and, as that increased, I gave the most favourable interpretation to his silence. I construed it into delicacy of sentiment, as if he dreaded to wound my pride by expressing his commiseration in words, leaving his generous conduct to speak for itself.

"It now approached six o'clock in the evening; and as I had eaten no breakfast, and as my spirits were raised, my appetite for dinner grew uncommonly keen. At length the old woman came into the room with two plates, one spoon, and a dirty cloth, which she laid upon the table. This appearance, without increasing my spirits, did not diminish my appetite. My protectress soon returned with a small bowl of sago, a small porringer of sour milk, a loaf of stale brown bread, and the heel of an old cheese all over crawling with mites. My friend apologized that his illness obliged him to live on slops, and that better fare was not in the house; observing, at the same time, that a milk diet was certainly the most healthful; and at eight o'clock he again recommended a regular life, declaring that for his part he would *lie down with the lamb and rise with the lark*. My hunger was at this time so exceedingly sharp that I wished for another slice of the loaf, but was obliged to go to bed without even that refreshment.

"The lenten entertainment I had received made me resolve to depart as soon as possible; accordingly, next morning, when I spoke of going, he did not oppose my resolution; he rather commended my design, adding some very sage counsel upon the occasion. 'To be sure,' said he, 'the longer you stay away from your mother, the more you will grieve her and your other friends; and possibly they are already afflicted at hearing of this foolish expedition you have made.' Notwithstanding all this, and without any hope of softening such a sordid heart, I again renewed the tale of my distress, and asking 'how he thought I could travel above a hundred miles upon one half-crown?' I begged to borrow a single guinea, which I assured him should be repaid with thanks. 'And you know, sir,' said I, 'it is no more than I have done for you.' To which he firmly answered, 'Why, look you, Mr. Goldsmith, that is neither here nor there. I have paid you all you ever lent me, and this sickness of mine has left me bare of cash. But I have bethought myself of a conveyance for you; sell your horse, and I will furnish you a much better one to ride on.' I readily grasped at his proposal, and begged to see the nag; on which he led me to his bedchamber, and from under the bed he pulled out a stout oak stick. 'Here he is,' said he; 'take this in your hand, and it will carry you to your mother's with more safety than such a horse as you ride.' I was in doubt, when I got it into my hand, whether I should not, in the first place, apply it to his pate; but a rap at the street-door made the wretch fly to it, and when I returned to the parlour, he introduced me, as if nothing of the kind had happened, to the gentleman who entered, as Mr. Goldsmith, his most ingenious and worthy friend, of whom he had so often heard him speak with rapture. I could scarcely compose myself; and must have betrayed indignation in my mien to the stranger, who was a counsellor at law in the neighbourhood, a man of engaging aspect and polite address.

"After spending an hour, he asked my friend and me to dine with him at his house. This I declined at first, as I wished to have no farther communication with my old hospitable friend; but at the solicitation of both I at last consented, determined as I was by two motives; one, that I was prejudiced in favour of the looks and manner of the counsellor; and the other, that I stood in need of a comfortable dinner. And there, indeed, I found everything that I could wish, abundance without profusion, and elegance without affectation. In the evening, when my old friend, who had eaten very plentifully at his neighbour's table, but talked again of lying down with the lamb, made a motion to me for retiring, our generous host requested I should take a bed with him, upon which I plainly told my old friend that he might go home and take care of the horse he had given me, but that I should never re-enter his doors. He went away with a laugh, leaving me to add this to the other little things the counsellor already knew of his plausible neighbour.

"And now, my dear mother, I found sufficient to reconcile me to all my follies; for here I spent three whole days. The counsellor had two sweet girls to his daughters, who played enchantingly on the harpsichord; and yet it was but a melancholy pleasure I felt the first time I heard them; for that being the first time also that either of them had touched the instrument since their mother's death, I saw the tears in silence trickle down their father's cheeks. I every day endeavoured to go away, but every day was pressed and obliged to stay. On my going, the counsellor offered me his purse, with a horse and servant to convey me home; but the latter I declined, and only took a guinea to bear my necessary expenses on the road.

"Oliver Goldsmith.

"To Mrs. Anne Goldsmith, Ballymahon."

A new consultation was held among his friends as to his future course, and it was determined he should try the law. His uncle Contarine agreed to advance the necessary funds, and actually furnished him with fifty pounds, with which he set off for London to enter on his studies at the Temple. Unfortunately, he fell in company at Dublin with a Roscommon acquaintance, one whose wits had been sharpened about town, who beguiled him into a gambling-house, and soon left him as penniless as when he bestrode the redoubtable Fiddle-back.

He was so ashamed of this fresh instance of gross heedlessness and imprudence, that he remained some time in Dublin without communicating to his friends his destitute condition. They heard of it, however, and he was invited back to the country, and indulgently forgiven by his generous uncle, but less readily by his mother, who was mortified and disheartened at seeing all her early hopes of him so repeatedly blighted. His brother Henry, too, began to lose patience at these successive failures, resulting from thoughtless indiscretion; and a quarrel took place, which for some time interrupted their usually affectionate intercourse.

After an interval of some months, Goldsmith was once more fitted out by his uncle and friends for a foray into the world. He had attempted divinity and law without success; it was now determined he should try physic, and he was accordingly sent to Edinburgh to commence his studies. His outset in that city came near adding to the list of his disasters. Having taken lodgings hap-hazard and left his trunk there, containing all his worldly effects, he sallied forth to see the town. After sauntering about the streets until a late hour, he thought of returning home, when, to his confusion, he found he had not acquainted himself either with the name of his landlady or of the street in which she lived. Fortunately, in the height of his whimsical perplexity, he met the cawdy or porter who had carried his trunk, and who now served him as a guide.

He did not remain long in the lodgings in which he had put up. The hostess was too adroit at that hocus-pocus of the table which often is practised in cheap boarding-houses. No one could conjure a single joint through a greater variety of forms. A loin of mutton, according to Goldsmith's own account, would serve him and two fellow-students a whole week. "A brandered chop was served up one day, a fried steak another, collops with onion sauce a third, and so on until the fleshy parts were quite consumed, when finally a dish of broth was manufactured from the bones on the seventh day, and

dlady rested from her labours." Gold-
had a good-humoured mode of taking
and for a short time amused himself with
ts and expedients of his landlady, which
him in a ludicrous manner; he soon,
, fell in with fellow-students from his
intry, whom he joined at more eligible
s.

ow attended medical lectures, and at-
himself to an association of students
he Medical Society. He set out, as usual,
e best intentions, but, as usual, soon fell
le, convivial, thoughtless habits. Edin-
was indeed a place of sore trial for one of
perament. Convivial meetings were all
ue, and the tavern was the universal ral-
ace of good-fellowship. And then Gold-
intimacies lay chiefly among the Irish
s, who were always ready for a wild freak
ic. Among them he was a prime favour-
somewhat of a leader, from his exuber-
spirits, his vein of humour, and his talent
ing an Irish song and telling an Irish

usual carelessness in money-matters at-
him. Though his supplies from home
anty aud irregular, he never could bring
into habits of prudence and economy;
e was stripped of all his present finances
, often he lavished them away in fits of
ded charity or generosity. Sometimes
his boon companions he assumed a ludi-
wagger in money-matters, which no one
rd was more ready than himself to laugh
a convivial meeting with a number of
w-students, he suddenly proposed to draw
th any one present which of the two
treat the whole party to the play. The
t the proposition had bolted from his
heart was in his throat. "To my great
secret joy," said he, "they all declined
llenge. Had it been accepted, and had I
the loser, a part of my wardrobe must
en pledged in order to raise the money."

ing worthy of preservation appeared from
during his residence at Edinburgh; and,
his poetical powers, highly as they had
timated by his friends, had not, as yet,
ed anything of superior merit. His con-
alents seem to have gained him attentions
gh quarter, which, however, he had the
ense to appreciate correctly. "I have
says he, in one of his letters, "more than
ight every second day at the Duke of
on's; but it seems they like me more as
than as a companion; so I disdained so
an employment, as unworthy my calling
ysician."

spending two winters at Edinburgh he
d to finish his medical studies on the
ent, for which his uncle Contarine agreed
ish the funds. "I intend," said he, in a
o his uncle, "to visit Paris, where the great Farheim, Petit, and Du Hammel de Monceau instruct their pupils in all the branches of medicine. I shall spend the spring and summer in Paris, and the beginning of next winter go to Leyden. The great Albinus is still alive there, and 'twill be proper to go, though only to have it said that we have studied in so famous a university. * * * I shall carry just £33 to France, with good store of clothes, shirts, &c., &c., and that, with economy, will serve."

Thus slenderly provided, he set off for Leith to take shipping for Holland. Medical instruction was the ostensible motive for his expedition, but the real one was doubtless his long-cherished desire to see foreign parts. When arrived at Leith there was a ship about to sail for Bordeaux, with six agreeable passengers. Goldsmith could not resist a sudden impulse, and, instead of embarking for Holland, soon found himself ploughing the seas bound to the other side of the Continent. Scarcely had the ship been two days at sea, when she was driven by stress of weather to Newcastle-upon-Tyne. Of course Goldsmith and his fellow-voyagers went on shore to "refresh themselves after the fatigues of their voyage." Of course they frolicked and made merry, when, late in the evening, in the midst of their hilarity, the door was burst open, a sergeant and twelve grenadiers entered with fixed bayonets, and took the whole convivial party prisoners. It seems that Goldsmith's chance companions were Scotchmen in the French service, who had been in Scotland enlisting soldiers for the French army. It was in vain that Goldsmith protested his innocence; he was marched off with his fellow-revellers to prison, whence he with difficulty obtained his release at the end of a fortnight. With his customary facility, however, he found everything turn out for the best. His imprisonment had saved his life. The ship had proceeded without him on her voyage, but had been wrecked at the mouth of the Garonne, and all the crew drowned.

A vessel being now on the point of sailing for Holland, he embarked, and in nine days arrived at Rotterdam, from whence he proceeded, without any more deviations, to Leyden. He gives a whimsical picture, in one of his letters, of the appearance of the Hollanders. "The modern Dutchman is quite a different creature from him of former times: he in everything imitates a Frenchman but in his easy, disengaged air. He is vastly ceremonious, and is, perhaps, exactly what a Frenchman might have been in the reign of Louis XIV. Such are the better bred. But the downright Hollander is one of the oddest figures in nature. Upon a lank head of hair he wears a half-cocked narrow hat, laced with black riband; no coat, but seven waistcoats and nine pair of breeches, so that his hips reach up almost to his armpits. This well-clothed vegetable is now fit to see company or make love. But what a pleasing creature is the object of his appetite! why, she wears a large fur cap, with a deal of

Flanders lace; and for every pair of breeches he carries, she puts on two petticoats.

"A Dutch lady burns nothing about her phlegmatic admirer but his tobacco. You must know, sir, every woman carries in her hand a stove of coals, which, when she sits, she snugs under her petticoats, and at this chimney dozing Strephon lights his pipe."

The country itself awakened his admiration. "Nothing," said he, "can equal its beauty; wherever I turn my eyes, fine houses, elegant gardens, statues, grottoes, vistas, present themselves; but when you enter their towns you are charmed beyond description. No misery is to be seen here; every one is usefully employed." And again, in his noble description in "The Traveller,"

"To men of other minds my fancy flies,
Imbosom'd in the deep where Holland lies.
Methinks her patient sons before me stand,
Where the broad ocean leans against the land,
And, sedulous to stop the coming tide,
Lift the tall rampire's artificial pride,
Onward, methinks, and diligently slow,
The firm connected bulwark seems to grow;
Spreads its long arms amid the watery roar,
Scoops out an empire, and usurps the shore.
While the pent ocean, rising o'er the pile,
Sees an amphibious world beneath him smile;
The slow canal, the yellow-blossom'd vale,
The willow-tufted bank, the gliding sail,
The crowded mart, the cultivated plain,
A new creation rescued from his reign."

He remained about a year at Leyden, attending the lectures of Gaubius on chemistry and Albinus on anatomy; though his studies are said to have been miscellaneous, and directed to literature rather than science. The thirty-three pounds with which he had set out on his travels were soon consumed, and he was put to many a shift to meet his expenses until his precarious remittances should arrive. Sometimes he had to borrow small sums, which he always scrupulously paid; sometimes he taught the English language, and sometimes, unfortunately, he resorted to the gambling-tables, which in those days abounded in Holland. This last resource terminated, as usual, in stripping him of every shilling.

A generous friend, who had often counselled him in vain against his unfortunate propensity, now stepped in to his relief, but on condition of his quitting the sphere of danger. Goldsmith gladly consented to leave Holland, being anxious to visit other parts. He intended to proceed to Paris and pursue his studies there, and was furnished by his friend with money for the journey. Unluckily, he rambled into the garden of a florist just before quitting Leyden. The tulip mania was still prevalent in Holland, and some species of that splendid flower brought immense prices. In wandering through the garden Goldsmith recollected that his uncle Contarine was a tulip fancier. The thought suddenly struck him that here was an opportunity of testifying, in a delicate manner, his sense of that generous uncle's past kindnesses. In an instant his hand was in his pocket; a number of choice tulip-roots were purchased and packed up for Mr. Contarine; and it was not until he had payed for them that he bethought himself that he had spent all the money borrowed for his travelling expenses. Too proud, however, to give up his journey, and too shamefaced to make another appeal to his friend's liberality, he determined to travel on foot, and depend upon chance and good luck for the means of getting forward; and it is said that he actually set off on a tour of the Continent with but one spare shirt, and without a shilling in his pocket.

"Blessed with a good constitution," says one of his biographers, "an adventurous spirit, and with that thoughtless, or, perhaps, happy disposition which takes no care for to-morrow, he continued his travels for a long time in spite of innumerable privations." In his amusing narrative of the adventures of a "Philosophic Vagabond" in the "Vicar of Wakefield," we find shadowed out the expedients he pursued. He depended upon his learning, such as it was, to make his way among the religious establishments which in those days held out hospitality to the wayfarer, while he relied upon his flute to win his way among the peasantry. "Whenever I approached a peasant's house towards nightfall," said he, "I played one of my merriest tunes, and that procured me not only a lodging, but subsistence for the next day; but in truth I must own, whenever I attempted to entertain persons of a higher rank, they always thought my performance odious, and never made me any return for my endeavours to please them."

In his "Traveller," too, he pictures himself making his way with his flute through the beautiful country of Louvain.

"Gay sprightly land of mirth and social ease,
Pleased with thyself, whom all the world can please,
How often have I led thy sportive choir,
With tuneless pipe beside the murmuring Loire!
Where shading elms along the margin grew,
And freshen'd from the wave the zephyr flew;
And haply, though my harsh touch falt'ring still,
But mock'd all tune, and marr'd the dancer's skill;
Yet would the village praise my wondrous power,
And dance, forgetful of the noontide hour.
Alike all ages. Dames of ancient days
Have led their children through the mirthful maze,
And the gay grandsire, skill'd in gestic lore,
Has frisk'd beneath the burden of threescore."

At Paris he attended the chemical lectures of the celebrated Rouelle, and became acquainted with Voltaire, who won his heart by an eloquent defence in conversation of English taste and learning against the attacks of Fontenelle. His ramblings took him into Germany and Switzerland, from which last-mentioned country he sent to his brother in Ireland the first brief sketch of his poem of "The Traveller."

At Geneva he became travelling tutor to a mongrel young gentleman, son of a London pawnbroker, who had been suddenly elevated into fortune and absurdity by the death of an uncle. The youth, before setting up for a gentleman, had been an attorney's apprentice, and was an arrant pettifogger in money-matters. Never were two beings more illy assorted than he and Goldsmith. There were continual difficulties on all points of expense; and, when they reached Marseilles, they were both glad to separate. We may form an idea of the tutor and the pupil from the following extract from the narrative of the Philosophic Vagabond.

"I was to be the young gentleman's governor, but with a proviso that he should always be permitted to govern himself. My pupil, in fact, understood the art of guiding in money-concerns much better than I. He was heir to a fortune of about two hundred thousand pounds, left him by an uncle in the West Indies; and his guardians, to qualify him for the management of it, had bound him apprentice to an attorney. Thus avarice was his prevailing passion; all his questions on the road were how money might be saved—which was the least expensive course of travel—whether anything could be bought that would turn to good account when disposed of again in London? Such curiosities on the way as could be seen for nothing, he was ready enough to look at; but if the sight of them was to be paid for, he usually asserted that he had been told that they were not worth seeing. He never paid a bill that he would not observe how amazingly expensive travelling was: and all this though not yet twenty-one. When arrived at Leghorn, as we took a walk to look at the port and shipping, he inquired the expense of the passage by sea home to England. This he was informed was but a trifle compared to his returning by land; he was therefore unable to withstand the temptation; so, paying me the small part of my salary that was due, he took leave, and embarked with only one attendant for London."

Once more on foot, but freed from the irksome duties of "bear leader," he continued his half vagrant peregrinations through part of France and Piedmont, and various of the Italian states. At Padua, where he remained several months, he is said to have taken his medical degree. Thus far he had been assisted by occasional remittances from his uncle Contarine; but, about this time, the death of that generous relation left him entirely to his own resources. He had acquired, however, a habit of shifting along and living by expedients, and a new one presented itself in Italy. "My skill in music," says he, in the Philosophic Vagabond, "could avail me nothing in a country where every peasant was a better musician than I; but by this time I had acquired another talent, which answered my purpose as well, and this was a skill in disputation. In all the foreign universities and convents there are, upon certain days, philosophical theses maintained against every adventitious disputant: for which, if the champion opposes with any dexterity, he can claim a gratuity in money, a dinner, and a bed for one night. In this manner, then, I fought my way towards England, walked along from city to city, examined mankind more nearly, and, if I may so express it, saw both sides of the picture." Though a poor wandering scholar, his reception in these learned piles was as free from humiliation as in the cottages of the peasantry. "With the members of these establishments," said he, "I could converse on topics of literature, *and then I always forgot the meanness of my circumstances.*"

After two years spent in gratifying his roving propensities, "pursuing novelty and losing content," he landed at Dover early in 1756, with the intention of making his way to London; but how was he to get there? His money was all expended, and England was to him as completely a strange land as any part of the Continent. His flute and his philosophy were no longer of any avail; for the peasantry did not care for music, and the learned and the clergy would not give a vagrant scholar a supper and night's lodging for the best thesis that ever was argued. In this extremity he is said to have resorted to the stage as a temporary expedient, and to have figured in low comedy with a strolling company at a country town in Kent. This accords with his last shift of the Philosophic Vagabond, and with the knowledge of country theatricals displayed in his "Adventures of a Strolling Player." Whatever means he used in making his way to London, it is certain he made his entrance there with but a few halfpence in his pocket.

Here, then, he was, in the great metropolis, "without friend, recommendation, money, or impudence." What was to be done to gain the immediate means of subsistence? With some difficulty, and after referring for a character to his friends in the University of Dublin, he at length obtained the situation of usher to a school. Here he remained but a short time; and of all the expedients he had resorted to in his shifting career, this was one of which he ever spoke with the most thorough disgust. We may judge what were the mortifications to which he was subjected by the reply given to the "Philosophic Vagabond" by a person to whom he applied for a situation of the kind. "Ay," cried he, "this is indeed a very pretty career that has been chalked out for you. I have been an usher at a boarding-school myself; and may I die by an anodyne necklace but I had rather be under turnkey in Newgate. I was up early and late; I was browbeat by the master, hated for my ugly face by the mistress, worried by the boys within, and never permitted to stir out to receive civility abroad. But are you sure you are fit for a school? Let us examine you a little. Have you been bred apprentice to the business?" "No." "Then you won't do for a school. Can you dress the boys' hair?" "No." "Then you won't do for a school. Have you had the smallpox?"

"No." "Then you won't do for a school. Can you lie three in a bed?" "No." "Then you will never do for a school. Have you a good stomach?" "Yes." "Then you will by no means do for a school." "The truth is," observes he in another place, "in spite of all their labours to please, they (the ushers) are generally the laughing-stock of the school. Every trick is played upon the usher; the oddity of his manners, his dress, or his language, are a fund of eternal ridicule; the master himself cannot avoid joining in the laugh; and the poor wretch, eternally resenting this ill usage, seems to live in a state of warfare with all the family." That this was a picture of poor Goldsmith himself, we may presume from the facts of his having an awkward, clumsy person, a pock-marked face; of his being at times odd in his dress, eccentric in his manners, and his having an Irish brogue.

His next shift was as assistant in the laboratory of a chemist near Fish-street Hill. After remaining here a few months, he heard that Dr. Sleigh, who had been his friend and fellow-student at Edinburgh, was in London. Eager to meet with a friendly face in this land of strangers, he immediately called on him; "but though it was Sunday, and it is to be supposed I was in my best clothes, Sleigh scarcely knew me—such is the tax the unfortunate pay to poverty. However, when he did recollect me, I found his heart as warm as ever, and he shared his purse and friendship with me during his continuance in London."

Through the advice and assistance of Dr. Sleigh, he now commenced the practice of medicine, but in a small way, and chiefly among the poor; for he wanted the figure, address, polish, and management to succeed among the rich. As his fees were necessarily small and ill-paid, he had to assist himself with his pen; and here again Dr. Sleigh was of service in introducing him to some of the booksellers, who immediately gave him tolerable employment.

He now began to form literary acquaintances, the most distinguished of whom were Richardson, author of Pamela, Sir Charles Grandison, &c., and Dr. Young, author of the Night Thoughts. The first account we have of him in his literary character in London is from one of his Edinburgh friends, Dr. Farr. "From the time of Goldsmith's leaving Edinburgh in the year 1754, I never saw him till the year 1756, when I was in London attending the hospitals and lectures. Early in January he called upon me one morning before I was up, and, on my entering the room, I recognised my old acquaintance, dressed in a rusty, full-trimmed black suit, with his pockets full of papers, which instantly reminded me of the poet in Garrick's farce of Lethe. After we had finished our breakfast he drew from his pocket part of a tragedy, which he said he had brought for my correction. In vain I pleaded inability, when he began to read; and every part on which I expressed a doubt as to the propriety was immediately blotted out. I then most earnestly pressed him not to trust to my judgment, but to take the opinion of persons better qualified to decide on dramatic compositions. He now told me he had submitted his production, so far as he had written, to Mr. Richardson, the author of Clarissa, on which I peremptorily declined offering another criticism on the performance.

"In this visit I remember his relating a strange Quixotic scheme he had in contemplation, of going to decipher the inscriptions on the *Written Mountains*, though he was altogether ignorant of Arabic, or the language in which they might be supposed to be written. The salary of three hundred pounds per annum, which had been left for the purpose, was the temptation."

Nothing farther has ever been heard of the tragedy here mentioned; it was probably never completed. As to the romantic scheme respecting the *Written Mountains*, it was probably one of the many dreamy projects with which his fervid brain was apt to teem. On such subjects he was prone to talk vaguely and magnificently, but inconsiderately, from a kindled imagination rather than a well-instructed judgment. He had a great notion of expeditions to the East, and wonders to be seen and effected in the Oriental countries.

Goldsmith was not always arrayed in rusty black. Another account of him during his medical career decks him out in the tarnished elegance of an old second-hand suit of green and gold, with a shirt and neckcloth of a fortnight's wear. His coat of velvet was patched on the left breast with a new piece, to conceal which he held his hat over the place during his medical visits: a notable expedient, which attracted attention, and raised a good-natured laugh at his expense.

Without waiting patiently for the slow growth of a medical reputation and practice, he was again induced to change his pursuit, and undertake the management of a classical school of eminence at Peckham, in Surrey. The master, Dr. Milner, a dissenting minister, was ill; his son, who had been a fellow-student with Goldsmith at Edinburgh, and had a favourable opinion of his attainments and abilities, recommended him to his father as one well-qualified to conduct the establishment during his illness. He remained some time in this situation, and acquitted himself to the satisfaction of Dr. Milner. He was a favourite, too, with the scholars, from his easy, indulgent good-nature; he mingled in their sports; spent his money in treating them to schoolboy dainties, and told them droll stories, and played on the flute for their entertainment. His familiarity was sometimes carried too far; he indulged in boyish pranks and practical jokes, and drew upon himself retorts in kind. As usual, his benevolent feelings were a heavy tax upon his purse, for he never could resist a tale of distress, and was apt to be fleeced by every sturdy beggar.

At Dr. Milner's table he became acquainted with Mr. Griffiths, proprietor of the Monthly Review, who, after a few experiments of his literary talents, engaged him as a regular contributor. Again, therefore, he changed his mode of life, and in April 1757, became an inmate in the house of the bookseller, with a fixed salary. He soon found the diurnal drudgery of this task insupportable. He had to write daily from nine o'clock until two, and often the whole day, and was treated as a mere literary hack by both Griffiths and his wife. But what was worse than all, his writings were liable to be altered and retouched by both those personages, for Mrs. Griffiths was a literary lady, and assisted her husband in the Review. At the end of six or seven months this arrangement was broken off by mutual consent.

He now wrote occasionally for the Literary Magazine, a production set on foot by Mr. John Newbury, bookseller, St. Paul's Churchyard, renowned in nursery literature throughout the latter half of the last century for his picture-books for children. Newbury was a worthy, intelligent, kind-hearted man, and was a real friend to authors, often relieving them when in pecuniary difficulties. Goldsmith introduces him in a humorous yet friendly manner in the "Vicar of Wakefield." "This person was no other than the philanthropic bookseller in St. Paul's Churchyard, who has written so many little books for children; he called himself their friend; but he was the friend of all mankind. He was no sooner alighted but he was in haste to be gone; for he was ever on business of importance, and was at that time actually compiling materials for the history of one Mr. Thomas Trip. I immediately recollected this good-natured man's red-pimpled face."

Being now known in the publishing world, he found employment in other quarters; he also resumed his medical practice, but with very trifling success. The scantiness of his purse still obliged him to live in obscure lodgings somewhere in the vicinity of Salisbury Square, Fleet-street; but his extended acquaintance and rising importance caused him to consult appearances. He adopted an expedient, then very common, and still practised in London among those who have to tread the narrow path between pride and poverty; while he burrowed in lodgings suited to his means, he "hailed," as it is termed, from the Temple Exchange Coffee-house near Temple Bar. Here he received his medical calls; from hence he dated his letters, and here he passed much of his leisure hours, conversing with the frequenters of the place. Indeed, coffee-houses in those days were the resorts of wits and literati; where the topics of the day were gossipped over, and the affairs of literature and the drama discussed and criticised. In this way he enlarged the circle of his intimacy, which now embraced several names of notoriety.

His friends in Ireland received accounts of his literary success and of the distinguished acquaintances he was making. This was enough to put the wise heads at Lishoy and Ballymahon in a ferment of conjectures. With the exaggerated notions of provincial relations concerning the family great man in the metropolis, some of Goldsmith's poor kindred pictured him to themselves seated in high places, clothed in purple and fine linen, and hand and glove with the givers of gifts and the dispensers of patronage. Accordingly, he was one day surprised at the sudden apparition, in his miserable lodging, of his younger brother Charles, a raw youth of twenty-one, endowed with a double share of the family heedlessness, and who expected to be forthwith helped into some snug by-path to fortune by one or other of Oliver's great friends. Charles was sadly disconcerted on learning that, so far from being able to provide for others, his brother could scarcely take care of himself. He looked round with a rueful eye on the poet's quarters, and could not help expressing his surprise and disappointment at finding him no better off. "All in good time, my dear boy," replied poor Goldsmith, with infinite good-humour; "I shall be richer by-and-by. Addison, let me tell you, wrote his poem of the Campaign in a garret in the Haymarket, three stories high, and you see I am not come to that yet, for I have only got to the second story."

One of the objects of the following letter to his brother-in-law was probably to dissipate any further illusions concerning his fortunes that might be indulged by his friends in Ballymahon.

"*To Daniel Hodson, Esq., at Lishoy, near Ballymahon, Ireland.*

"DEAR SIR,

"It may be four years since my last letters went to Ireland—to you in particular. I received no answer; probably because you never wrote to me. My brother Charles, however, informs me of the fatigue you were at in soliciting a subscription to assist me, not only among my friends and relatives, but acquaintance in general. Though my pride might feel some repugnance at being thus relieved, yet my gratitude can suffer no diminution. How much am I obliged to you, to them, for such generosity, or (why should not your virtues have their proper name?) for such charity to me at that juncture. Sure I am born to ill fortune, to be so much a debtor and unable to repay. But to say no more of this: too many professions of gratitude are often considered as indirect petitions for future favours. Let me only add, that my not receiving that supply was the cause of my present establishment in London. You may easily imagine what difficulties I had to encounter, left as I was without friends, recommendations, money, or impudence, and that in a country where being born an Irishman was sufficient to keep me unemployed. Many, in such circumstances, would have had recourse to the friar's cord or the suicide's halter. But, with all my follies, I had principle to resist the one, and resolution to combat the other.

"I suppose you desire to know my present situation. As there is nothing in it at which I should blush or which mankind could censure, I see no reason for making it a secret. In short, by a very little practice as a physician, and a very little reputation as a poet, I make a shift to live. Nothing is more apt to introduce us to the gates of the muses than poverty; but it were well if they only left us at the door. The mischief is, they sometimes choose to give us their company to the entertainment; and want, instead of being gentleman-usher, often turns master of the ceremonies.

"Thus, upon learning I write, no doubt you imagine I starve; and the name of an author naturally reminds you of a garret. In this particular I do not think proper to undeceive my friends. But, whether I eat or starve, live in a first floor or four pairs of stairs high, I still remember them with ardour; nay, my very country comes in for a share of my affection. Unaccountable fondness for country, this *maladie du pais*, as the French call it! Unaccountable that he should still have an affection for a place who never, when in it, received above common civility; who never brought anything out of it except his brogue and his blunders. Surely my affection is equally ridiculous with the Scotchman's, who refused to be cured of the itch because it made him unco' thoughtful of his wife and bonny Inverary.

"But, now, to be serious: let me ask myself what gives me a wish to see Ireland again. The country is a fine one, perhaps? no. There are good company in Ireland? no. The conversation there is generally made up of a smutty toast or a bawdy song; the vivacity supported by some humble cousin, who had just folly enough to earn his dinner. Then perhaps there's more wit and learning among the Irish? Oh, Lord, no! There has been more money spent in the encouragement of the Padareen mare there one season, than given in rewards to learned men since the time of Usher. All their productions in learning amount to perhaps a translation, or a few tracts in divinity; and all their productions in wit to just nothing at all. Why the plague, then. so fond of Ireland? Then, all at once, because you, my dear friend, and a few more who are exceptions to the general picture, have a residence there. This it is that gives me all the pangs I feel in separation. I confess I carry this spirit sometimes to the souring the pleasures I at present possess. If I go to the opera, where Signora Columba pours out all the mazes of melody, I sit and sigh for Lishoy fireside, and Johnny Armstrong's 'Last Good-night' from Peggy Golden. If I climb Hampstead Hill, than where nature never exhibited a more magnificent prospect, I confess it fine; but then I had rather be placed on the little mount before Lishoy gate, and there take in, to me, the most pleasing horizon in nature.

"Before Charles came hither, my thoughts sometimes found refuge from severer studies among my friends in Ireland. I fancied strange revolutions at home; but I find it was the rapidity of my own motion that gave an imaginary one to objects really at rest. No alterations there. Some friends, he tells me, are still lean, but very rich; others very fat, but still very poor. Nay, all the news I hear of you is, that you sally out in visits among the neighbours, and sometimes make a migration from the blue bed to the brown. I could from my heart wish that you and she (Mrs. Hodson), and Lishoy and Ballymahon, and all of you, would fairly make a migration into Middlesex; though, upon second thoughts, this might be attended with a few inconveniences. Therefore, as the mountain will not come to Mohammed, why Mohammed shall go to the mountain; or, to speak plain English, as you cannot conveniently pay me a visit, if next summer I can contrive to be absent six weeks from London, I shall spend three of them among my friends in Ireland. But first, believe me, my design is purely to visit, and neither to cut a figure nor levy contributions; neither to excite envy nor solicit favour; in fact, my circumstances are adapted to neither. I am too poor to be gazed at, and too rich to need assistance.

"You see, dear Dan, how long I have been talking about myself; but attribute my vanity to my affection: as every man is fond of himself, and I consider you as a second self, I imagine you will consequently be pleased with these instances of egotism. * * * My dear sir, these things give me real uneasiness, and I could wish to redress them. But at present there is hardly a kingdom in Europe in which I am not a debtor. I have already discharged my most threatening and pressing demands, for we must be just before we can be grateful. For the rest, I need not say (you know I am)

"Your affectionate kinsman,
"Oliver Goldsmith."

Charles Goldsmith did not remain long to embarrass his brother in London. With the same roving disposition and inconsiderate temper of Oliver, he suddenly departed in an humble capacity to seek his fortune in the West Indies, and nothing was heard of him for above thirty years, when, after having been given up as dead by his friends, he made his reappearance in England.

Goldsmith continued writing miscellaneously for reviews and other periodical publications, without making any decided *hit* in literature, to use a technical term; he also resumed for a short time the superintendence of Dr. Milner's school. This he was induced to do by a promise of that gentleman to use his interest, which was considerable, in procuring him a medical appointment in India. Dr. Milner kept his promise, and, through his means, Goldsmith was actually appointed physician and surgeon to one of the factories on the coast of Coromandel. His imagination was immediately on fire with visions of Oriental wealth and magnificence. It is true, the salary he was to receive was small, not above one hundred pounds per annum. But then the practice of the place, he was informed, would amount to no less than one thousand pounds per annum; then there were advantages to be derived from trade, and from the high interest of money—twenty per cent.; in short, he saw the way to fortune lying broad and straight before him. The only difficulty was how to raise funds for his outfit, which would be expensive; but fortunately, he was at that moment preparing for the press a treatise upon "the Present State of Polite Literature in Europe," the profits of which, he felt assured, would be sufficient to carry him to India. He accordingly drew up proposals to publish the work by subscription, and claimed the assistance of his friends to give them a wide circulation.

While this was in agitation, he presented himself, without the knowledge of his friends, at the College of Surgeons for examination as an hospital mate. So low were his finances and so scanty his wardrobe, that he had not the means of appearing in a befitting garb before the examining surgeons. In this emergency, he prevailed on Griffiths to become his security to a tailor for a new suit; informing him that he wanted it for a single occasion, on which depended his appointment to a situation in the army; and that, as soon as this temporary purpose was served, the clothes should be immediately returned or paid for. In the meantime, in consideration of Griffith's kindness in standing his security, Goldsmith furnished him with four articles for his review.

From the records of the College of Surgeons, it appears that Goldsmith underwent his examination at Surgeons' Hall in December 1758. Either from a real want of surgical science, or from a confusion of mind incident to sensitive and imaginative persons on such occasions, he failed in his examination, and was rejected as unqualified. The effect of such a rejection was to disqualify him for every branch of public service, though he might have claimed a re-examination after the interval of a few months devoted to further study. Such a re-examination he never attempted, nor did he ever communicate his discomfiture to any of his friends. They learned with surprise that he had suddenly relinquished his appointment to India, about which he had indulged such sanguine expectations: some accused him of fickleness and caprice; others supposed him unwilling to tear himself from the growing fascinations of the literary society of London. It is only recently that the true cause has been traced, by the indefatigable research of one of his biographers, to this rejection at Surgeons' Hall.

While Goldsmith was suffering under the mortification of defeat and the disappointment of his Oriental hopes, other circumstances occurred to lacerate his feelings. His poverty and imprudence had driven him to various straits. He had failed to return, according to promise, the new suit of clothes in which he had stood his unfortunate examination, or to send the amount to the tailor. What was worse, Griffiths discovered the identical suit at a pawnbroker's, where Goldsmith had raised money on it in a moment of pressure. The bookseller now dreaded that some books lent to the poet would share the same fate. He forthwith wrote a letter to Goldsmith, couched in abusive language. The latter replied in a tone of general apology, but without satisfying Griffiths; who, conceiving the whole a mere shift to raise money, wrote another letter still more harsh than the first, and containing threats of prosecution and a prison.

The following letter from poor Goldsmith gives the most touching picture of an inconsiderate but sensitive man, harassed by care, stung by humiliations, and driven almost to despondency.

"Sir,

"I know of no misery but a jail to which my own imprudences and your letter seem to point. I have seen it inevitable these three or four weeks, and, by heavens! request it as a favour—as a favour that may prevent somewhat more fatal. I have been some years struggling with a wretched being—with all that contempt that indigence brings with it—with all those passions which make contempt insupportable. What, then, has a jail that is formidable? I shall at least have the society of wretches, and such is to me true society. I tell you again and again, that I am neither able nor willing to pay you a farthing, but I will be punctual to any appointment you or the tailor shall make; thus far, at least, I do not act the sharper, since, unable to pay my own debts one way, I would generally give some security another. No, sir; had I been a sharper—had I been possessed of less good-nature and native generosity—I might surely now have been in better circumstances.

"I am guilty, I own, of meannesses which poverty unavoidably brings with it: my reflections are filled with repentance for my imprudence, but not with any remorse for being a villain; that may be a character you unjustly charge me with. Your books, I can assure you, are neither pawned nor sold, but in the custody of a friend, from whom my necessities obliged me to borrow some money; whatever becomes of my person, you shall have them in a month. It is very possible both the reports you have heard and your own suggestions may have brought you false information with respect to my character; it is very possible that the man whom you now regard with detestation may inwardly burn with grateful resentment. It is very possible that, upon a second perusal of the letter I sent you, you may see the workings of a mind strongly agitated with gratitude and jealousy. If such circumstances should appear, at least spare invective till my book with Mr. Dodsley shall be published, and then, perhaps, you may see the bright side of a mind, when my professions shall not appear the dictates of necessity, but of choice.

"You seem to think Dr. Milner knew me not. Perhaps so; but he was a man I shall ever honour; but I have friendships only with the dead! I ask pardon for taking up so much time; nor shall I add to it by any other professions than that I am, sir, your humble servant,

"Oliver Goldsmith.

"P. S.—I shall expect impatiently the result of your resolutions."

The dispute between the poet and the publisher was afterward imperfectly adjusted, and it would appear that the clothes were paid for by a short compilation advertised by Griffiths in the course of the following month; but the parties were never really friends afterward, and the writings of Goldsmith were harshly and unjustly treated in the Monthly Review.

Yet, after all this self-abasement on the part of poor Goldsmith, this self-accusation of the "meannesses which poverty unavoidably brings with it," the reader will be surprised to learn that the act which excited the indignation of the wealthy man of trade, the pawning of the clothes, almost admitted by Goldsmith as a crime, resulted from a tenderness of heart and a generosity of hand in which another man would have gloried. He was living at the time in miserable lodgings, and hard pressed for the means of subsistence. In the midst of his own troubles, he was surprised by the entrance into his room of the poor woman from whom he hired his lodgings, and to whom he owed some small arrears of rent. She had a piteous tale of distress; her husband had been arrested for debt and thrown into prison. This was too much for the quick feelings of Goldsmith. He had no money in his pocket, it is true, but there was the new suit of clothes in which he had stood his unlucky examination at Surgeons' Hall. Without giving himself time for reflection, he sent it off to the pawnbroker's, and raised thereon a sufficient sum to pay off his own debt and to release his landlord from prison. Such was one of the many instances of inconsiderate generosity which involved poor Goldsmith in scrapes, and drew on him the censures of the prudent and the selfish.

And now let us be indulged in a few particulars about these lodgings in which Goldsmith was guilty of this thoughtless act of benevolence. They were in a very shabby house, No. 12, Green Arbour Court, between the Old Bailey and Fleet Market. An old woman was still living in 1820 who was a relative of the identical landlady whom Goldsmith relieved by the money received from the pawnbroker. She was a child about seven years of age at the time that the poet rented his apartment of her relative, and used frequently to be at the house in Green Arbour Court. She was drawn there, in a great measure, by the good-humoured kindness of Goldsmith, who was always exceedingly fond of the society of children. He used to assemble those of the family in his room, give them cakes and sweetmeats, and set them dancing to the sound of his flute. He was very friendly to those around him, and cultivated a kind of intimacy with a watchmaker in the Court, who possessed much native wit and humour. He passed most of the day, however, in his room, and only went out in the evenings. His days were no doubt devoted to the drudgery of the pen, and it would appear that he occasionally found the booksellers urgent taskmasters. On one occasion a visitor was shown up to his room, and immediately their voices were heard in high altercation, and the key was turned within the lock. The landlady, at first, was disposed to go to the assistance of her lodger; but a calm succeeding, she forbore to interfere.

Late in the evening the door was unlocked; a supper ordered by the visitor from a neighbouring tavern, and Goldsmith and his intrusive guest finished the evening in great good-humour. It was supposed to be some impatient publisher, whose press was waiting, and who found no other mode of getting a stipulated task from Goldsmith than by locking him in, and staying by him until it was finished.

But we have a more particular account of these lodgings in Green Arbour Court from the Rev. Thomas Percy, afterward Bishop of Dromore, and celebrated for his relics of ancient poetry, his beautiful ballads, and other works. During an occasional visit to London, he was introduced to Goldsmith by Grainger, and ever after continued one of his most steadfast and valued friends. The following is his description of the poet's squalid apartment: "I called on Goldsmith at his lodgings in March 1759, and found him writing his 'Inquiry,' in a miserable, dirty-looking room, in which there was but one chair; and when, from civility, he resigned it to me, he himself was obliged to sit in the window. While we were conversing together some one tapped gently at the door, and, being desired to come in, a poor, ragged little girl, of a very becoming demeanour, entered the room, and, dropping a courtesy, said, 'My mamma sends her compliments, and begs the favour of you to lend her a chamber-pot full of coals.'"

We are reminded in this anecdote of Goldsmith's picture of the lodgings of Beau Tibbs

of the peep into the secrets of a make-shift
blishment given to a visitor by the blunder-
old Scotch-woman.

By this time we were arrived as high as the
rs would permit us to ascend, till we came to
t he was facetiously pleased to call the first
r over the chimney; and, knocking at the
r, a voice from within demanded 'who's
re?' My conductor answered that it was
. But this not satisfying the querist, the
e again repeated the demand, to which he
wered louder than before; and now the door
opened by an old woman with cautious re-
ance.

When we got in he welcomed me to his house
h great ceremony; and, turning to the old
nan, asked where was her lady. 'Good troth,'
lied she, in a peculiar dialect, 'she's washing
r twa shirts at the next door, because they
e taken an oath against lending the tub any
ger.' 'My two shirts,' cried he, in a tone that
ered with confusion; 'what does the idiot
an?' 'I ken what I mean weel enough,'
lied the other; 'she's washing your twa shirts
the next door, because—' 'Fire and fury!
more of this stupid explanation,' cried he;
and inform her we have company. Were that
tch hag to be for ever in my family, she would
er learn politeness, nor forget that absurd
sonous accent of hers, or testify the smallest
cimen of breeding or high life; and yet it is
y surprising too, as I had her from a Parlia-
nt man, a friend of mine from the Highlands,
of the politest men in the world; but that's
cret.'"[*]

et us linger a little in Green Arbour Court, a
ce consecrated by the genius and the poverty
Goldsmith, but recently obliterated in the
rse of modern improvements. The writer of
s memoir visited it not many years since on a
rary pilgrimage, and may be excused for re-
ting a description of it which he has hereto-
e inserted in another publication. "It then
sted in its pristine state, and was a small
are of tall and miserable houses, the very in-
tines of which seemed turned inside out, to
ge from the old garments and frippery that
tered from every window. It appeared to
a region of washer-women, and lines were
etched about the little square, on which clothes
re dangling to dry.

"Just as we entered the square, a scuffle took
ce between two viragoes about a disputed
ht to a washtub, and immediately the whole
munity was in a hubbub. Heads in mob
s peeped out of every window, and such a
mour of tongues ensued that I was fain to
p my ears. Every amazon took part with one
other of the disputants, and brandished her
ns, dripping with soapsuds, and fired away
n her window as from the embrasure of a fortress; while the screams of children, nestled and cradled in every procreant chamber of this hive, waking with the noise, set up their shrill pipes to swell the general concert."[†]

While in these forlorn quarters, suffering under extreme depression of spirits, caused by his failure at Surgeons' Hall, the disappointment of his hopes, and his harsh collisions with Griffiths, Goldsmith wrote the following letter to his brother Henry, some parts of which are most touchingly mournful.

"DEAR SIR,

"Your punctuality in answering a man whose trade is writing, is more than I had reason to expect; and yet you see me generally fill a whole sheet, which is all the recompense I can make for being so frequently troublesome. The behaviour of Mr. Mills and Mr. Lawdor is a little extraordinary. However, their answering neither you nor me is a sufficient indication of their disliking the employment which I assigned them. As their conduct is different from what I had expected, so I have made an alteration in mine. I shall, the beginning of next month, send over two hundred and fifty books,[‡] which are all that I fancy can be well sold among you, and I would have you make some distinction in the persons who have subscribed. The money, which will amount to sixty pounds, may be left with Mr. Bradley as soon as possible. I am not certain but I shall quickly have occasion for it.

"I have met with no disappointment with respect to my East India voyage, nor are my resolutions altered; though, at the same time, I must confess, it gives me some pain to think I am almost beginning the world at the age of thirty-one. Though I never had a day's sickness since I saw you, yet I am not that strong, active man you once knew me. You scarcely can conceive how much eight years of disappointment, anguish, and study have worn me down. If I remember right, you are seven or eight years older than me, yet I dare venture to say, that, if a stranger saw us both, he would pay me the honours of seniority. Imagine to yourself a pale, melancholy visage, with two great wrinkles between the eyebrows, with an eye disgustingly severe, and a big wig; and you may have a perfect picture of my present appearance. On the other hand, I conceive you as perfectly sleek and healthy, passing many a happy day among your own children, or those who knew you a child.

"Since I knew what it was to be a man, this is a pleasure I have not known. I have passed my days among a parcel of cool, designing beings, and have contracted all their suspicious manner in my own behaviour. I should actually be as unfit for the society of my friends at home, as I detest that which I am obliged to partake of here. I can now neither partake of the pleasure of a revel, nor contribute to raise its jollity. I can neither laugh nor drink; have contracted a hesitating, disagreeable manner of speaking, and a visage that looks ill-nature itself; in short, I have thought myself into a settled melancholy, and an utter disgust of all that life brings with it. Whence this romantic turn that all our family are possessed with? Whence this love for every place and every country but that in which we reside—for every occupation but our own? this desire of fortune, and yet this eagerness to dissipate? I perceive, my dear sir, that I am at intervals for indulging this splenetic manner, and following my own taste, regardless of yours.

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[*] Citizen of the World, Letter lv.

[†] Tales of a Traveller, vol. i.

[‡] The Inquiry into Polite Literature. His previous remarks apply to the subscription.

"The reasons you have given me for breeding up your son a scholar are judicious and convincing; I should, however, be glad to know for what particular profession he is designed. If he be assiduous and divested of strong passions (for passions in youth always lead to pleasure), he may do very well in your college; for it must be owned that the industrious poor have good encouragement there, perhaps better than in any other in Europe. But if he has ambition, strong passions, and an exquisite sensibility of contempt, do not send him there, unless you have no other trade for him but your own. It is impossible to conceive how much may be done by proper education at home. A boy, for instance, who understands perfectly well Latin, French, arithmetic, and the principles of the civil law, and can write a fine hand, has an education that may qualify him for any undertaking; and these parts of learning should be carefully inculcated, let him be designed for whatever calling he will.

"Above all things, let him never touch a romance or novel: these paint beauty in colours more charming than nature, and describe happiness that man never tastes. How delusive, how destructive are those pictures of consummate bliss! They teach the youthful mind to sigh after beauty and happiness that never existed; to despise the little good which fortune has mixed in our cup, by expecting more than she ever gave; and, in general, take the word of a man who has seen the world, and who has studied human nature more by experience than precept: take my word for it, I say, that books teach us very little of the world. The greatest merit in a state of poverty would only serve to make the possessor ridiculous—may distress, but cannot relieve him. Frugality, and even avarice, in the lower orders of mankind, are true ambition. These afford the only ladder for the poor to rise to preferment. Teach then, my dear sir, to your son, thrift and economy. Let his poor wandering uncle's example be placed before his eyes. I had learned from books to be disinterested and generous, before I was taught from experience the necessity of being prudent. I had contracted the habits and notions of a philosopher, while I was exposing myself to the approaches of insidious cunning; and often by being, even with my narrow finances, charitable to excess, I forgot the rules of justice, and placed myself in the very situation of the wretch who thanked me for my bounty. When I am in the remotest part of the world, tell him this, and perhaps he may improve from my example. But I find myself again falling into my gloomy habits of thinking.

"My mother, I am informed, is almost blind; even though I had the utmost inclination to return home, under such circumstances I could not, for to behold her in distress without a capacity of relieving her from it would add too much to my splenetic habit. Your last letter was much too short; it should have answered some queries I had made in my former. Just sit down as I do, and write forward until you have filled all your paper. It requires no thought, at least from the ease with which my own sentiments rise when they are addressed to you. For, believe me, my head has no share in all I write; my heart dictates the whole. Pray give my love to Bob Bryanton, and entreat him from me not to drink. My dear sir, give me some account of poor Jenny.[*] Yet her husband loves her: if so, she cannot be unhappy.

"I know not whether I should tell you—yet why should I conceal these trifles, or, indeed, anything from you? There is a book of mine will be published in a few days: the Life of a very extraordinary man; no less than the great Voltaire. You know already by the title that it is no more than a catchpenny. However, I spent but four weeks on the whole performance, for which I received twenty pounds. When published, I shall take some method of conveying it to you, unless you may think it dear of the postage, which may amount to four or five shillings. However, I fear you will not find an equivalent of amusement.

"Your last letter, I repeat it, was too short; you should have given me your opinion of the design of the heroi-comical poem which I sent you. You remember I intended to introduce the hero of the poem as lying in a paltry alehouse. You may take the following specimen of the manner, which I flatter myself is quite original. The room in which he lies may be described somewhat in this way:

"'The window, patched with paper, lent a ray
That feebly show'd the state in which he lay:
The sanded floor that grits beneath the tread,
The humid wall with paltry pictures spread;
The game of goose was there exposed to view,
And the twelve rules the royal martyr drew;
The Seasons, framed with listing, found a place,
And Prussia's monarch show'd his lamp-black face.
The morn was cold: he views with keen desire
A rusty grate unconscious of a fire;
An unpaid reckoning on the frieze was scored,
And five crack'd teacups dress'd the chimney board.'

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[*] His sister, Mrs. Johnston; her marriage, like that of Mrs. Hodson, was private, but in pecuniary matters much less fortunate.

"And now imagine, after his soliloquy, the landlord to make his appearance in order to dun him for the reckoning;

"'Not with that face, so servile and so gay,
That welcomes every stranger that can pay:
With sulky eye he smoked the patient man,
Then pull'd his breeches tight, and thus began,' &c.[*]

"All this is taken, you see, from nature. It is a good remark of Montaigne's, that the wisest men often have friends with whom they do not care how much they play the fool. Take my present follies as instances of my regard. Poetry is a much easier and more agreeable species of composition than prose; and, could a man live by it, it were not unpleasant employment to be a poet. I am resolved to leave no space, though I should fill it up only by telling you, what you very well know already, I mean that I am your most affectionate friend and brother,

"OLIVER GOLDSMITH."

Towards the end of March, 1759, the treatise on which Goldsmith had laid so much stress, on which he at one time had calculated to defray the expense of his outfit to India, and to which he had adverted in his correspondence with Griffiths, made its appearance. It was published by the Dodsleys, and entitled "An Inquiry into the Present State of Polite Learning in Europe."

In the present day, when the whole field of contemporary literature is so widely surveyed and amply discussed, and when the current productions of every country are constantly collated and ably criticised, a treatise like that of Goldsmith would be considered as extremely limited and unsatisfactory; but at that time it possessed novelty in its views, and being the most important production that had yet come from his pen, and possessing his peculiar charm of style, it had a profitable sale, and added to his reputation.

In fact, he had now grown into sufficient literary importance to become an object of hostility to the underlings of the press. One of the most virulent attacks upon him was in a criticism on this treatise, and appeared in the Monthly Review, to which he himself had been recently a contributor. It slandered him as a man while it decried him as an author, and accused him, by innuendo, of "labouring under the infamy of having, by the vilest and meanest actions, forfeited all pretensions to honour and honesty," and of practising "those acts which bring the sharper to the cart's tail or the pillory."

It will be remembered that the Review was owned by Griffiths the bookseller, with whom Goldsmith had recently had a misunderstanding. The criticism, therefore, was no doubt dictated by the lingerings of resentment, and the imputations upon Goldsmith's character for honour and honesty, and the vile and mean actions hinted at, could only allude to the unfortunate pawning of the clothes. All this, too, was after Griffiths had received the affecting letter from Goldsmith, drawing a picture of his poverty and perplexities, and after the latter had made him a literary compensation. Griffiths, in fact, was sensible of the falsehood and extravagance of the attack, and tried to exonerate himself by declaring that the criticism was written by a person in his employ; but we see no difference in atrocity between him who wields the knife and him who hires the cut-throat. It may be well, however, in passing, to bestow our mite of notoriety upon the miscreant who launched the slander. He deserves it for a long course of dastardly and venomous attacks, not merely upon Goldsmith, but upon most of the successful authors of the day. His name was Kenrick. He was originally a mechanic, but, possessing some degree of talent and industry, he applied himself to literature as a profession. This he pursued for many years, and tried his hand in every department of prose and poetry; he wrote plays and satires, philosophical tracts, critical dissertations, and works on philology; nothing from his pen ever rose to first-rate excellence, or gained him a popular name, though he received from some university the degree of Doctor of Laws. Dr. Johnson characterized his literary career in one short sentence: "Sir, he is one of the many who have made themselves *public* without making themselves *known*."

Soured by his own want of success, jealous of the success of others, his natural irritability of temper increased by habits of intemperance, he at length abandoned himself to the practice of reviewing, and became one of the Ishmaelites of the press. In this his malignant bitterness soon gave him a notoriety which his talents had never been able to attain. We shall dismiss him for the present with the following sketch of him by the hand of one of his contemporaries:

"Dreaming of genius which he never had,
Half wit, half fool, half critic, and half mad;
Seizing, like Shirley, on the poet's lyre,
With all his rage, but not one spark of fire:
Eager for slaughter, and resolved to tear
From others' brows that wreath he must not wear—
Next Kenrick came: all furious, and replete
With brandy, malice, pertness, and conceit;
Unskill'd in classic lore, through envy blind
To all that's beauteous, learned, or refined;
For faults alone behold the savage prowl,
With reason's offal glut his ravening soul;
Pleased with his prey, its inmost blood he drinks,
And mumbles, paws, and turns it—till it stinks."

Goldsmith now wrote for various periodical publications, such as the Bee, the Busy-Body, and the Lady's Magazine. His essays, though characterized by his delightful style, his pure, benevolent morality, and his mellow, unobtrusive humour, did not produce equal effect at first with more garish writings of infinitely less value; they

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[*] The projected poem, of which the above were specimens, appears never to have been completed.

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did not "strike," as it is termed; but they had that rare and enduring merit which rises in estimation on every perusal. They gradually stole upon the heart of the public, were copied into numerous contemporary publications, and now they are garnered up among the choice productions of British literature.

About this time Goldsmith engaged with Dr. Smollett, who was about to launch the British Magazine. Smollett was a complete schemer and speculator in literature, and intent upon enterprises that had money rather than reputation in view. Goldsmith has a good-humoured hit at this propensity in one of his papers in the Bee, in which he represents Johnson, Hume, and others taking seats in the stage-coach bound for Fame, while Smollett prefers that destined for Riches.

Another prominent employer of Goldsmith was Mr. John Newbery, who engaged him to contribute occasional essays to a newspaper entitled the Public Ledger, which made its first appearance on the 12th of January, 1760. His most valuable and characteristic contributions to this paper were his Chinese Letters, subsequently modified into the Citizen of the World. These lucubrations attracted general attention; they were reprinted in the various periodical publications of the day, and met with great applause. The name of the author, however, was as yet but little known.

Being now easier in circumstances, and in the receipt of frequent sums from the booksellers, Goldsmith, about the middle of 1760, emerged from his dismal abode in Green Arbour Court, and took respectable apartments in Wine-office Court, Fleet-street.

Here he began to receive visits of ceremony, and to entertain his literary friends. Among the latter he now numbered several names of note, such as Guthrie, Murphy, Christopher Smart, and Bickerstaffe. He had also a numerous class of hangers-on, the small fry of literature; who, knowing his almost utter incapacity to refuse a pecuniary request, were apt, now that he was considered flush, to levy continual taxes upon his purse.

Among others, one Pilkington, an old college acquaintance, but now a shifting adventurer, duped him in the most ludicrous manner. He called on him with a face full of perplexity. A lady of the first rank having an extraordinary fancy for curious animals, for which she was willing to give enormous sums, he had procured a couple of white mice to be forwarded to her from India. They were actually on board of a ship in the river. Her grace had been apprized of their arrival, and was all impatience to see them. Unfortunately, he had no cage to put them in, nor clothes to appear in before a lady of her rank. Two guineas would be sufficient for his purpose, but where were two guineas to be procured!

The simple heart of Goldsmith was touched; but, alas! he had but half a guinea in his pocket. It was unfortunate; but, after a pause, his friend suggested, with some hesitation, "that money might be raised upon his watch: it would but be the loan of a few hours." So said, so done; the watch was delivered to the worthy Mr. Pilkington to be pledged at a neighbouring pawnbroker's, but nothing farther was ever seen of him, the watch, or the white mice. Goldsmith used often to relate, with great humour, this story of his credulous generosity; he was in some degree indemnified by its suggesting to him the amusing little story of Prince Bonbennin and the White Mouse in 'The Citizen of the World.'

About this time Goldsmith became personally acquainted with Dr. Johnson. Their first meeting took place on the 31st of May, 1761, at a literary supper given by Goldsmith to a numerous party at his new lodgings in Wine-office Court. His merit as an author had already been felt and acknowledged by Johnson, and he had secured the good-will of the great lexicographer by making honourable mention of him in the Bee and in his Chinese Letters. Dr. Percy called upon Johnson to take him to Goldsmith's lodgings; he found Johnson arrayed with unusual care in a new suit of clothes, a new hat, and a well-powdered wig; and could not but notice his uncommon spruceness. "Why, sir," replied Johnson, "I hear that Goldsmith, who is a very great sloven, justifies his disregard of cleanliness and decency by quoting my practice, and I am desirous this night to show him a better example."

The acquaintance thus commenced soon ripened into an intimate friendship, which continued through life.

Among the various schemes and plans in Goldsmith's vagrant imagination, was one for visiting the East and exploring the interior of Asia. He had, as has been before observed, a vague notion that valuable discoveries were to be made there, and many useful inventions in the arts brought back to the stock of European knowledge. "Thus, in Siberian Tartary," observes he, in one of his writings, "the natives extract a strong spirit from milk, which is a secret probably unknown to the chemists of Europe. In the most savage parts of India they are possessed of the secret of dyeing vegetable substances scarlet, and that of refining lead into a metal which, for hardness and colour, is little inferior to silver."

Goldsmith adds a description of the kind of person suited to such an enterprise, in which he evidently had himself in view.

"He should be a man of philosophical turn, one apt to deduce consequences of general utility from particular occurrences; neither swoln with pride nor hardened by prejudice; neither wedded to one particular system, nor instructed only in one particular science; neither wholly a botanist, nor quite an antiquarian; his mind should be tinctured with miscellaneous knowledge, and his manners humanized by an intercourse with men. He should be in some measure an enthusiast to the design; fond of travelling, from a rapid imagination and an innate love of change; furnished with a body capable of sustaining every fatigue, and a heart not easily terrified at danger."

In 1761, when Lord Bute became prime minister on the accession of George the Third, Goldsmith drew up a memorial on the subject, suggesting the advantages to be derived from a mission to those countries solely for useful and scientific purposes; and, the better to insure success, he preceded his application to government by an ingenious essay to the same effect in the Public Ledger.

His memorial and his essay were fruitless, his project most probably being deemed the dream of a visionary. Still it continued to haunt his mind, and he would often talk of making an expedition to Aleppo some time or other, when his means were greater, to inquire into the arts peculiar to the East, and to bring home such as might be valuable. Johnson, who knew how little poor Goldsmith was fitted by scientific lore for this favourite scheme of his fancy, scoffed at the project when it was mentioned to him. "Of all men," said he, "Goldsmith is the most unfit to go out upon such an inquiry, for he is utterly ignorant of such arts as we already possess, and consequently, could not know what would be accessions to our present stock of mechanical knowledge. Sir, he would bring home a grinding barrow, which you see in every street in London, and think that he had furnished a wonderful improvement."

His connexion with Newbery the bookseller now led him into a variety of temporary jobs, such as a pamphlet on the Cock-lane Ghost, a Life of Beau Nash, the Famous Master of Ceremonies at Bath, &c.: one of the best things for his fame, however, was the remodelling and republication of his Chinese Letters under the title of 'The Citizen of the World:' a work which has long since taken its merited stand among the classics of the English language. "Few works," it has been observed by one of his biographers, "exhibit a nicer perception or more delicate delineation of life and manners. Wit, humour, and sentiment pervade every page; the vices and follies of the day are touched with the most playful and diverting satire; and English characteristics, in endless variety, are hit off with the pencil of a master."

In seeking materials for his varied views of life, he often mingled in strange scenes and got involved in whimsical situations. In the summer of 1762 he was one of the thousands who went to see the Cherokee chiefs, whom he mentions in one of his writings. The Indians made their appearance in grand costume, hideously painted and besmeared. In the course of the visit Goldsmith made one of the chiefs a present, who, in the ecstacy of his gratitude, gave him an embrace that left his face well bedaubed with red ochre.

Towards the close of 1762 he removed to "merry Islington," then a country village, though now swallowed up in omnivorous London. He went there for the benefit of country air, his health being injured by literary application and confinement, and to be near his chief employer, Mr. Newbery, who resided in the Canonbury House. In this neighbourhood he used to take his solitary rambles, sometimes extending his walks to the gardens of the "White Conduit House," so famous among the essayists of the last century. While strolling one day in these gardens, he met three females of the family of a respectable tradesman to whom he was under some obligation. With his prompt disposition to oblige, he conducted them about the garden, treated them to tea, and ran up a bill in the most open-handed manner imaginable; it was only when he came to pay that he found himself in one of his old dilemmas—he had not the wherewithal in his pocket. A scene of perplexity now took place between him and the waiter, in the midst of which came up some of his acquaintances, in whose eyes he wished to stand particularly well. This completed his mortification. There was no concealing the awkwardness of his position. The sneers of the waiter revealed it. His acquaintances amused themselves for some time at his expense, professing their inability to relieve him. When, however, they had enjoyed their banter, the waiter was paid, and poor Goldsmith enabled to convoy off the ladies with flying colours.

About the beginning of 1763 Goldsmith became acquainted with Boswell, whose literary gossippings were destined to have a deleterious effect upon his reputation. Boswell was at that time a young man, light, buoyant, pushing, and presumptuous. He had a morbid passion for mingling in the society of men noted for wit and learning, and had just arrived from Scotland, bent upon making his way into the literary circles of the metropolis. Their first meeting was at the table of Mr. Thomas Davies, bookseller, in Russell-street, Covent Garden. Mr. Robert Dodsley, compiler of the well-known collection of modern poetry, was present. In the course of conversation, the merits of the current poetry of the day were discussed. Goldsmith declared there was none of superior merit. Dodsley cited his own collection in proof of the contrary. "It is true," said he, "we can boast of no palaces nowadays, like Dryden's Ode to St. Cecilia's Day, but we have villages composed of very pretty houses." Goldsmith, however, maintained that there was nothing above mediocrity, an opinion in which Johnson, to whom it was repeated, concurred, and with reason, for the era was one of the dead levels of British poetry.

Boswell, as yet, had not met with Dr. Johnson, the great literary luminary of the day: an intimacy with whom he had made the crowning object of his aspiring and somewhat ludicrous ambition. In the meantime, he was probably glad to make the acquaintance of Goldsmith, though as yet a star of lesser magnitude. Subsequently, however, when he had effected his purpose, and become the constant satellite of Johnson, he affected to undervalue Goldsmith, whose merits, in fact, were of a kind little calculated to strike his coarse perceptions.

The lurking hostility to Goldsmith discernible throughout Boswell's writings, has been attributed by some to a silly spirit of jealousy of the superior esteem evinced for the poet by Dr. Johnson. We have a gleam of this in his account of the first evening he spent in company with those two eminent authors, at their famous resort, the Mitre Tavern, in Fleet-street. This took place on the 1st of July, 1763. The trio supped together, and passed some time in literary conversation. On quitting the tavern, Johnson, who had now been sociably acquainted with Goldsmith for two years, and knew his merits, took him with him to drink tea with his blind pensioner, Miss Williams; a high privilege among his intimates and admirers. To Boswell, a recent acquaintance, whose intrusive sycophancy had not yet made its way into his confidential intimacy, he gave no invitation. Boswell felt it with all the jealousy of a little mind. "Dr. Goldsmith," says he, in his memoirs, "being a privileged man, went with him, strutting away, and calling to me with an air of superiority, like that of an esoteric over an exoteric disciple of a sage of antiquity, 'I go to Miss Williams.' I confess I then envied him this mighty privilege, of which he seemed to be so proud; but it was not long before I obtained the same mark of distinction."

Obtained! but how? not like Goldsmith, by the force of unpretending but congenial merit, but by a course of the most pushing, contriving, and spaniel-like subserviency. Really, the ambition of the man to illustrate his mental insignificance, by continually placing himself in perpetual juxtaposition with the great lexicographer, has something in it perfectly ludicrous. Never, since the days of Don Quixote and Sancho Panza, has there been presented to the world a more whimsically contrasted pair of associates than Johnson and Boswell.

A more congenial intimate gained by Goldsmith about this time was Mr., afterward Sir, Joshua Reynolds. They were men of kindred genius, excelling in corresponding qualities of their art,—for style in writing is what colour is in painting; both are innate endowments and equally magical in their effects. Certain graces and harmonies of both may be acquired by diligent study and imitation, but only in a limited degree; whereas by their natural possessors they are exercised spontaneously, almost unconsciously, and with ever-varying fascination. Reynolds soon understood and appreciated the merits of Goldsmith, and a sincere and lasting friendship ensued between them. Indeed, there are no friendships among men of talents more likely to be sincere than those between painters and poets. Possessed of the same qualities of mind, governed by the same principles of taste and natural laws of grace and beauty, but applying them to different yet mutually illustrative arts, they are constantly in sympathy, and never in collision with each other.

Among the various productions thrown off by Goldsmith for the booksellers during this growing period of his reputation, was a small work in two volumes, entitled 'The History of England, in a series of Letters from a Nobleman to his Son.' It was digested from Hume, Rapin, Carte, and Kennet. These authors he would read in the morning; make a few notes; ramble with a friend into the country about the skirts of "merry Islington;" return to a temperate dinner and cheerful evening; and before going to bed, write off what had arranged itself in his head from the studies of the morning. In this way he took a more general view of the subject, and wrote in a more free and fluent style than if he had been mousing at the time among authorities. The work, like many others written by Goldsmith in the earlier part of his literary career, was anonymous. Some attributed it to Lord Chesterfield, others to Lord Orrery, and others to Lord Lyttleton. The latter seemed pleased to be the putative father, and never disowned the bantling thus laid at his door; and well might he have been proud to be considered capable of producing what has been well-pronounced "the most finished and elegant summary of English history in the same compass that has been or is likely to be written."

The reputation of Goldsmith, it will be perceived, grew slowly; he was known and estimated by a few; but he had not those brilliant though fallacious qualities which flash upon the public, and excite loud but transient applause. His works were more read than cited; and the charm of style, for which he was especially noted, was more apt to be felt than talked about. He used often to repine, in a half-humorous, half-querulous manner, at his tardiness in gaining the laurels which he felt to be his due. "The public," he would exclaim, "will never do me justice; whenever I write anything, they make a point to know nothing about it."

Johnson had now become one of his best friends and advisers. He knew all the weak points of Goldsmith's character, but he knew also his merits; and, while he would rebuke him like a child, and would rail at his errors and follies, he would suffer no one to undervalue him. Goldsmith knew the soundness of his judgment and his practical benevolence, and often sought his counsel and aid amid the difficulties into which his indiscretion was continually plunging him.

"I received one morning," says Johnson, "a message from poor Goldsmith that he was in great distress, and, as it was not in his power to come to me, begging that I would come to him as soon as possible. I sent him a guinea, and promised to come to him directly. I accordingly went as soon as I was dressed, and found that his landlady had arrested him for his rent, at which he was in a violent passion: I perceived that he had already changed my guinea, and had a bottle of Madeira and a glass before him. I put the cork into the bottle, desired he would be calm, and began to talk to him of the means by which he might be extricated. He then told me that he had a novel ready for the press, which he produced to me. I looked into it, and saw its merit; told the landlady I should soon return; and, having gone to a bookseller, sold it for sixty pounds. I brought Goldsmith the money, and he discharged his rent, not without rating his landlady in a high tone for having used him so ill."

The novel in question was the 'Vicar of Wakefield:' the bookseller to whom Johnson sold it was Francis Newbery, nephew to John. Strange as it may seem, this captivating work, which has obtained and preserved an almost unrivalled popularity in various languages, was so little appreciated by the bookseller, that he kept it by him for two years unpublished!

Goldsmith had, as yet, produced nothing of moment in poetry. Among his literary jobs, it is true, was an Oratorio entitled 'The Captivity,' founded on the bondage of the Israelites in Babylon. It was one of those unhappy offsprings of the Muse, tortured into existence amid the distortions of music. One or two songs from it have been introduced among his other writings; the rest of the Oratorio has passed into oblivion. Goldsmith distrusted his powers to succeed in poetry, and doubted the disposition of the public mind in regard to it. "I fear," said he, "I have come too late into the world; Pope and other poets have taken up the places in the temple of Fame; and as few at any period can possess poetical reputation, a man of genius can now hardly acquire it." Again, on another occasion, he observes: "Of all kinds of ambition, as things are now circumstanced, perhaps that which pursues poetical fame is the wildest. What from the increased refinement of the times, from the diversity of judgment produced by opposing systems of criticism, and from the more prevalent divisions of opinion influenced by party, the strongest and happiest efforts can expect to please but in a very narrow circle."

At this very time he had by him his poem of 'The Traveller.' The plan of it, as has already been observed, was conceived many years before, during his travels in Switzerland, and a sketch of it sent from that country to his brother Henry in Ireland. The original outline is said to have embraced a wider scope; but it was probably contracted through diffidence, in the process of finishing the parts. It had lain by him for several years in a crude state, and it was with extreme hesitation and after much revision that he at length submitted it to Dr. Johnson. The frank and warm approbation of the latter encouraged him to finish it for the press; and Dr. Johnson himself contributed a few lines towards the conclusion.

We hear much about "poetic inspiration," and the "poet's eye in a fine phrensy rolling;" but Sir Joshua Reynolds gives an anecdote of Goldsmith while engaged upon his poem calculated to cure our notions about the ardour of composition. Calling upon the poet one day, he opened the door without ceremony, and discovered him in the double occupation of turning a couplet and teaching a pet dog to sit upon his haunches. At one time he would glance his eye at his desk, and at another shake his finger at the dog to make him retain his position. The last lines on the page before him were still wet; they form a part of the description of Italy:

> "By sports like these are all their cares beguiled,
> The sports of children satisfy the child."

Goldsmith, with his usual good-humour, joined in the laugh caused by his whimsical employment, and acknowledged that his boyish sport with the dog suggested the stanza.

The poem was published on the 19th of December, 1764, in a quarto form, by Newbery, and was the first of his works to which Goldsmith prefixed his name. As a testimony of cherished and well-merited affection, he dedicated it to his brother Henry. There is an amusing affectation of indifference as to its fate expressed in the dedication. "What reception a poem may find," says he, "which has neither abuse, party, nor blank verse to support it, I cannot tell, nor am I solicitous to know." The truth is, no one was more emulous and anxious for poetic fame; and never was he more anxious than in the present instance, for it was his grand stake. Dr. Johnson aided the launching of the poem by a favourable notice in the Critical Review; other periodical works came out in its favour. Some of the author's friends complained that it did not command instant and wide popularity; that it was a poem to win, not to strike: it went on rapidly increasing in favour; in three months a second edition was issued; shortly afterward a third; then a fourth; and, before the year was out, the author was pronounced the best poet of his time.

The effect of 'The Traveller' was instantaneous in elevating Goldsmith in the estimation of society. The circle of wits and literati accustomed to assemble at the house of Sir Joshua Reynolds, some of whom had hitherto treated him slightingly, now received him as a worthy compeer. Sir John Hawkins, afterward one of Johnson's biographers, acknowledged that he had been accustomed to consider Goldsmith a mere bookseller's drudge, and was surprised, on the publication of his poem, to find him gifted with such genius, and capable of such noble sentiments.

A poor attempt was made to take from his merit by asserting that Dr. Johnson was the author of many of the finest passages. This was ultimately defeated by Johnson himself, who marked with a pencil all that he had contributed, nine in number, inserted towards the conclusion, and by no means the best in the poem.

Goldsmith now felt called upon to improve his style of living. He accordingly took chambers in the Temple, that classic region, famous in the time of the British essayists as the abode of wits and men of letters, and which, with its retired courts and imbowered gardens, in the very heart of a noisy metropolis, is, to the quiet-seeking student and author, an oasis freshening with verdure in the midst of a desert.

His first chambers were not quite to his taste, which was growing a little fastidious. Johnson, in paying him a visit, went prying about the room in his near-sighted manner, examining things closely and minutely. Goldsmith, fidgeted by the scrutiny, and apprehending a disposition to find fault, observed that he should soon be in better chambers. "Nay, sir," said Johnson, "never mind that—nil te quæsiveris extra"—implying that his reputation rendered him independent of outward show. Goldsmith, however, was not convinced by this flattering compliment, but removed soon afterward to a more spacious and airy apartment, consisting of three rooms, on the second floor of No. 2, Brick Court. With his usual want of forethought, he obtained advances from booksellers and loans from private friends to enable him to furnish them expensively, and thus burdened himself with debts which continued to harass him for the remainder of his days. One of the friends who assisted him with his purse on this occasion was Mr. Edmund Bott, a barrister and man of letters, with whom he lived on the most intimate and cordial terms, and who had rooms immediately opposite, on the same floor.

The pleasant situation of Goldsmith's chambers may be gathered from his remarks in his 'Animated Nature' on the habitudes of rooks. "I have often amused myself with observing their plans of policy from my window in the Temple, that looks upon a grove where they have made a colony in the midst of a city. At the commencement of spring, the rookery, which, during the continuance of winter, seemed to have been deserted, or only guarded by about five or six, like old soldiers in a garrison, now begins to be once more frequented; and, in a short time, all the bustle and hurry of business will be fairly commenced."

Goldsmith was now in full communion with that association of wits, scholars, authors, artists, and statesmen, subsequently known as the Literary Club. It was formed fortuitously, and grew out of occasional meetings of men of talent at the table of Sir Joshua Reynolds. These took a regular form about the year 1764, when the plan of a club was suggested by Sir Joshua Reynolds to Johnson and Burke, and met with their immediate concurrence. The number of members was limited to twelve: they were to meet and sup together once a-week at the Turk's Head in Gerrard-street, Soho. Two members were to be sufficient to constitute a meeting. The original members were Sir Joshua Reynolds, Johnson, Burke, Dr. Nugent (Burke's father-in-law), Dr. Goldsmith, Topham Beauclerk, Mr. Langton, Mr. Chamier, and Sir John Hawkins. For three or four years the club did not reach to the stipulated number of twelve, though afterward it was increased to thirty. It has continued down to the present day, and has enrolled among its members many of the most distinguished men of Great Britain. Its era of greatest brilliancy, however, was during the time of Johnson, Burke, Beauclerk, Reynolds, and Goldsmith; when the conversational powers of its members rendered its sessions the highest of intellectual treats, and protracted them until a late hour of the night. The proposition to increase the number of members originated with Goldsmith. It would give, he thought, an agreeable variety to their meetings; "for there can be nothing new among us," said he; we have travelled over each other's minds." Johnson was piqued at the idea that *his* mind could possibly be travelled over and exhausted; but Sir Joshua Reynolds felt and acknowledged the force of Goldsmith's suggestion, and his proposition was adopted.

It is to be regretted that we have such scanty records of the "table-talk" of this famous club during this period of its glory. Boswell, who was admitted into it some few years after its institution, affords us a few tantalizing gleams; but his scraps of conversation are given merely to set forth his hero, Dr. Johnson, and contain but few of the choice sayings of his fellow-members. Above all, he had almost uniformly a disposition to underrate Goldsmith, and to place him in an absurd point of view. The latter, in truth, does not appear to have shone in this club to as much advantage as others of a less learned and more convivial nature. He was not prepared to cope with the colloquial giants among whom he now mingled; yet he felt himself entered in the lists, and engaged in honour to fight his way; so he often went on at a venture, occasionally delighting the company by his ingenuity and humour, at other times amusing them by his blunders.

Several remarks of Johnson are on record, which hit off in brief terms the conversational qualities of the poet. "The misfortune of Goldsmith in conversation," says he, "is this: he goes on without knowing how he is to get off. His genius is great, but his knowledge is small.

As they say of a generous man it is a pity he is not rich, we may say of Goldsmith it is a pity he is not knowing. He would not keep his knowledge to himself." And, on another occasion, he observes: "Goldsmith, rather than not talk, will talk of what he knows himself to be ignorant, which can only end in exposing him. If in company with two founders, he would fall a-talking on the method of making cannon, though both of them would soon see that he did not know what metal a cannon is made of." And again: "Goldsmith should not be for ever attempting to shine in conversation; he has not temper for it, he is so much mortified when he fails. Sir, a game of jokes is composed partly of skill, partly of chance; a man may be beat at times by one who has not the tenth part of his wit. Now Goldsmith putting himself against another, is like a man laying a hundred to one, who cannot spare the hundred. It is not worth a man's while. A man should not lay a hundred to one unless he can easily spare it, though he has a hundred chances for him; he can get but a guinea, and he may lose a hundred. Goldsmith is in this state. When he contends, if he gets the better, it is a very little addition to a man of his literary reputation; if he does not get the better, he is miserably vexed."

That Goldsmith should occasionally lose temper in discussions with Johnson is not surprising, considering the rudeness to which he was subjected by the imperious lexicographer whenever he was likely to get the better of him in argument. "There is no arguing with Johnson," said he once very happily; "for, when his pistol misses fire, he knocks you down with the butt-end of it."

In several of the intellectual collisions between them, recorded by Boswell as triumphs of Dr. Johnson, it really appears to us that Goldsmith had the best both of the wit and the argument, and especially of the courtesy and good-nature.

On one occasion he certainly gave Johnson a capital reproof as to his own colloquial peculiarities. Talking of fables, Goldsmith observed that the animals introduced in them seldom talked in character. "For instance," said he, "the fable of the little fishes who saw birds fly over their heads, and, envying them, petitioned to Jupiter to be changed into birds. The skill consists in making them talk like little fishes." Just then observing that Dr. Johnson was shaking his sides and laughing, he immediately added, "Why, Dr. Johnson, this is not so easy as you seem to think; for, if you were to make little fishes talk, they would talk like whales."

Johnson, in fact, was spoiled by being the oracle of the circle in which he moved. He talked as he wrote, for effect; and, being devoutly listened to, talked long and large, "orated" on the most petty subjects, and was impatient of interruption or contradiction. Goldsmith had a proper reverence for his talents and his virtues, but not such blind bigotry as some of those around him. He felt that the oracle could sometimes err and often prose. Boswell gives an account of a dinner-party, at which, by his own account, Johnson monopolized the conversation, and had more than once cut Goldsmith short by abrupt contradictions, when the latter was really in the right. Goldsmith, at length, finding it impossible to get a fair chance at the discussion, took up his hat to go away, but remained for a time with it in his hand, "like a gamester who, at the end of a long night, lingers for a little while to see if he can have a favourable opportunity to finish with success." Once he was beginning to speak, when he was overpowered by the loud voice of Johnson, who was at the opposite end of the table; whereupon he threw down, as it were, his hat and his argument, and, darting an angry glance at Johnson, exclaimed, in a bitter tone, "Take it!"

Just then another person was beginning to speak, when Johnson, uttering some sound as if about to interrupt him, Goldsmith exclaimed, "Sir, the gentleman has heard you patiently for an hour; pray allow us now to hear him." "Sir," replied Johnson, sternly, "I was not interrupting the gentleman; I was only giving him a signal of my attention. Sir, you are impertinent."

The belligerent parties met the same evening at the club, Goldsmith still brooding over the harsh reproof he had experienced. Johnson perceived this; and, knowing the placable nature of the man, observed, "I'll make Goldsmith forgive me;" then calling to him in a loud tone, "Dr. Goldsmith," said he, "something passed to-day where you and I dined. I ask your pardon." The ire of the poet was extinguished in an instant. "It must be much from you, sir," said he, placidly, "that I take ill."

Another anecdote, given to prove Goldsmith's jealousy of Dr. Johnson, will probably be considered by the reader rather an instance of his aptness in rebuking ill-breeding. Goldsmith was conversing in company with great vivacity, and apparently to the satisfaction of those around him, when an honest Swiss who sat near, one George Michael Moser, Keeper of the Royal Academy, perceiving Dr. Johnson rolling himself as if about to speak, exclaimed, "Stay, stay; Toctor Shohnson is going to say something." "And are you sure, sir," replied Goldsmith, sharply, "that *you* can comprehend what he says?"

That Goldsmith often failed in conversation at the club in his effort to appear wise and learned, or to cope with the oracular sententiousness of Johnson, we readily believe; conversation was then a mere task to him, and he never was good at a task of any kind. He could not, like Johnson, study and mould his sentences when talking, as he was accustomed to do when writing. He used to say of himself, that he always argued best when he argued alone; that is to say, that he could master a subject in his study with his pen in his hand; but, when he came in company, grew confused, and was unable to talk upon it.

He shone most when he least thought of shining: when he gave way to his natural impulses, and talked carelessly and at random. Even Boswell spoke favourably of him in that respect. "For my part," said he, "I like very well to hear honest Goldsmith talk away carelessly;" and many a much wiser man than Boswell delighted in those outpourings of a fertile fancy and generous heart. In his happy moods, Goldsmith had an artless simplicity and buoyant good-humour, that led to a thousand amusing blunders and whimsical confessions, much to the entertainment of the club: yet, in his most thoughtless garrulity, there was occasionally the gleam of the gold and the flash of the diamond.

The mention of the Literary Club has led us out of the chronological order of our facts, and several of the anecdotes just given occurred at different periods of Goldsmith's intercourse with London society. Let us return to the time of the publication of 'The Traveller.'

Among the distinguished persons who were struck with the merits of this poem was the Earl (afterward Duke) of Northumberland, then lord-lieutenant of Ireland. He procured and read several of Goldsmith's other productions, and, being charmed with their style, expressed to his relative, Dr. Percy, on his return to England in 1765, a desire to extend his patronage to the author. Through Dr. Percy's means an interview took place, of which Goldsmith used to give the following account:

"I dressed myself in the best manner I could, and, after studying some compliments I thought necessary on such an occasion, proceeded to Northumberland House, and acquainted the servants that I had particular business with the duke. They showed me into an antechamber, where, after waiting some time, a gentleman very elegantly dressed made his appearance. Taking him for the duke, I delivered all the fine things I had composed in order to compliment him on the honour he had done me; when, to my great astonishment, he told me I had mistaken him for his master, who would see me immediately. At that instant the duke came into the apartment, and I was so confounded on the occasion, that I wanted words barely sufficient to express the sense I entertained of the duke's politeness, and went away exceedingly chagrined at the blunder I had committed."

Sir John Hawkins, in his life of Dr. Johnson, gives some farther particulars of this visit, of which he was, in part, a witness. "Having one day," says he, "a call to make on the late Duke, then Earl, of Northumberland, I found Goldsmith waiting for an audience in an outer room: I asked him what had brought him there; he told me, an invitation from his lordship. I made my business as short as I could, and, as a reason, mentioned that Dr. Goldsmith was waiting without. The earl asked me if I was acquainted with him. I told him I was, adding what I thought was most likely to recommend him. I retired, and stayed in the outer room to take him home. Upon his coming out, I asked him the result of his conversation. 'His lordship,' said he, 'told me he had read my poem, meaning 'The Traveller,' and was much delighted with it; that he was going to be lord-lieutenant of Ireland, and that, hearing I was a native of that country, he should be glad to do me any kindness.' And what did you answer,' said I, 'to this gracious offer?' 'Why,' said he, 'I could say nothing but that I had a brother there, a clergyman, that stood in need of help: as for myself, I have no great dependence on the promises of great men; I look to the booksellers for support; they are my best friends, and I am not inclined to forsake them for others.'" "Thus," continues Sir John, "did this idiot in the affairs of the world trifle with his fortunes, and put back the hand that was held out to assist him."

We cannot join with Sir John in his worldly sneer at the conduct of Goldsmith on this occasion. While we admire that honest independence of spirit which prevented him from asking favours for himself, we love that warmth of affection which instantly sought to advance the fortunes of a brother; but the peculiar merits of poor Goldsmith seem to have been little understood by the Hawkinses, the Boswells, and the other biographers of the day.

After all, the introduction to Northumberland House was not so complete a failure as the humorous account of Goldsmith and the cynical account of Hawkins would lead one to suppose; for, shortly after the visit above described, we find him printing and publishing a poem expressly for the amusement of the Countess. This was the beautiful Ballad of 'The Hermit,' originally published under the name of 'Edwin and Angelina.' It was suggested by an old English ballad beginning 'Gentle Herdsman,' shown him by Dr. Percy, who was at that time making his famous collection entitled 'Reliques of Ancient English Poetry,' which he submitted to the inspection of Goldsmith prior to publication. A few copies only of the Hermit were printed at first, with the following title-page: 'Edwin and Angelina: a Ballad. By Mr. Goldsmith. Printed for the Amusement of the Countess of Northumberland.'

The celebrity which Goldsmith had acquired by his poem of 'The Traveller,' occasioned a resuscitation of many of his miscellaneous and anonymous tales and essays from the various newspapers and other transient publications in which they lay dormant. These he published in 1765, in a collected form, under the title of 'Essays by Mr. Goldsmith.' "The following Essays," observes he in his preface, "have already appeared, at different times and in different pub-

The pamphlets in which they were in-
ing generally unsuccessful, these shared
mon fate, without assisting the book-
ims, or extending the author's reputa-
he public were too strenuously employed
ir own follies to be assiduous in esti-
nine ; so that many of my best attempts
vay have fallen victims to the transient
the times—the Ghost in Cock-Lane, or
of Ticonderoga.

though they have passed pretty silently
world, I can by no means complain of
ulation. The magazines and papers of
have indeed been liberal enough in this
Most of these essays have been regu-
rinted twice or thrice a-year, and con-
the public through the kennel of some
compilation. If there be a pride in
d editions, I have seen some of my la-
teen times reprinted, and claimed by
parents as their own. I have seen them
d at the beginning with praise, and
the end with the names of Philantos,
es, Phileleutheros, and Philanthropos.
ne, however, at last to vindicate my
and as these entertainers of the public,
all themselves, have partly lived upon
me years, let me now try if I cannot live
pon myself."

but little, in fact, for all the pecuniary
nt he received from the volume was
uineas. It had a good circulation, how-
translated into French, and has main-
stand among the British classics.

hstanding that the reputation of Gold-
d greatly risen, his finances were often
low ebb, owing to his heedlessness as to
his facility at being imposed upon, and
eous and irresistible habit of giving to
asked. He was obliged, therefore, to
all jobs proposed to him by the book-
nd kept up a kind of running account
Newbery, who was his banker on all
sometimes for pounds, sometimes for
and took his pay in manuscript. Many
effusions in moments of exigency were
anonymously, and never claimed. Some
have but recently been traced to his
ile of many the true authorship will pro-
ver be discovered. Among others, it is
, and with great probability, that he
Mr. Newbery the famous nursery story
y Two Shoes,' which appeared in 1765,
ent when Goldsmith was scribbling for
and much pressed for funds. Several
ttle tales introduced in his Essays show
ad a turn for this species of mock his-
d the advertisement and title-page bear
of his sly and playful humour.

re desired to give notice, that there is
ress, and speedily will be published, ei-
ubscription or otherwise, as the public
se to determine, the History of Little
Goody Two Shoes, otherwise Mrs. Margery Two Shoes ; with the means by which she acquired learning and wisdom, and, in consequence thereof, her estate ; set forth at large for the benefit of those

> "Who, from a state of rags and care,
> And having shoes but half a pair,
> Their fortune and their fame should fix,
> And gallop in a coach and six."

The world is probably not aware of the ingenuity, humour, good sense, and sly satire contained in many of the old English nursery-tales. They have evidently been the sportive productions of able writers, who would not trust their names to productions that might be considered beneath their dignity. The ponderous works on which they relied for immortality have perhaps sunk into oblivion, and carried their names down with them ; while their unacknowledged offspring, Jack the Giant Killer, Giles Gingerbread, and Tom Thumb, flourish in wide-spreading and never-ceasing popularity.

As Goldsmith had now acquired popularity and an extensive acquaintance, he attempted, with the advice of his friends, to procure a more regular and ample support by resuming the medical profession. He accordingly launched himself upon the town in style ; hired a man-servant ; replenished his wardrobe at considerable expense, and appeared in a professional wig and cane, purple silk smallclothes, and a scarlet roquelaure buttoned to the chin : a fantastic garb, as we should think at the present day, but not unsuited to the fashion of the times.

He soon, however, grew tired and impatient of the duties and restraints of his profession ; his practice was chiefly among his friends, and the fees were not sufficient for his maintenance ; he was disgusted with attendance on sick-chambers and capricious patients, and looked back with longing to his tavern haunts and broad convivial meetings, from which the dignity of his new calling restrained him. At length, on prescribing for a lady of his acquaintance, a warm dispute arose between him and the apothecary as to the quantity of medicine to be administered ; the lady adopted the opinion of the apothecary, and Goldsmith flung out of the house in a passion. "I am determined henceforth," said he to Topham Beauclerk, "to leave off prescribing for friends." "Do so, my dear doctor," was the reply ; "whenever you undertake to kill, let it be only your enemies." This was the end of Goldsmith's medical career.

The success of the poem of 'The Traveller,' and the popularity which it shed about its author, now roused the attention of the bookseller in whose hands the novel of the 'Vicar of Wakefield' had been slumbering for two long years. The mistake has generally prevailed that it was Mr. John Newbery to whom the manuscript had been sold, and much surprise has been expressed that he should have been insensible to its merits, and have suffered it to remain unpublished while putting forth so many inferior writings by the same author. But it was his nephew, Francis Newbery, who had become the fortunate purchaser, and who, not having had previous dealings with the author, like his uncle, had not the same confidence in his talent.

Booksellers, however, are prone to make egregious mistakes as to the merit of works in manuscript; to undervalue, if not reject, those of classic and enduring excellence, and to be captivated with the false brilliance of those written "for effect."

The success of this modest little volume must have astonished the tardy publisher. It came out on the 27th of March, 1766; before the end of May a second edition was called for; in three months more, a third; and so it went on, widening in a popularity that has never flagged; that has extended from country to country, and language to language, until it now embraces the whole reading world.

It is needless to dwell upon the merits of a work that has long since become a household book in every one's hand. The secret of its unusual and enduring popularity undoubtedly is its truth to nature, and to nature of the most amiable kind. The author has evidently taken his scenes and characters from originals in his own motley experience, and set them forth with the colourings of his own good head and heart.

The 'Vicar of Wakefield,' however, had scarcely made its appearance before its author was attacked in the newspapers. In one of the chapters he had introduced his ballad of 'The Hermit,' of which, as has been mentioned, a private edition of a few copies had been printed about two years previously for the use of the Countess of Northumberland. In the St. James's Chronicle, a fashionable journal of the day, appeared the following article:

"*To the Printer of the St. James's Chronicle.*

"Sir,

"In the Reliques of Ancient Poetry, published about two years ago, is a very beautiful little ballad, called 'A Friar of Orders Gray.' The ingenious editor, Mr. Percy, supposes that the stanzas sung by Ophelia in the play of Hamlet were parts of some ballad well known in Shakspeare's time, and from these stanzas, with the addition of one or two of his own to connect them, he has formed the above-mentioned ballad; the subject of which is, a lady comes to a convent to inquire for her love who had been driven there by her disdain. She is answered by a friar that he is dead:

"'No, no, he is dead, gone to his death's bed.
He never will come again.'

The lady weeps and laments her cruelty; the friar endeavours to comfort her with morality and religion, but all in vain; she expresses the deepest grief and the most tender sentiments of love, till at last the friar discovers himself:

"'And lo! beneath this gown of gray
Thy own true love appears.'

"This catastrophe is very fine, and the whole, joined with the greatest tenderness, has the greatest simplicity; yet, though this ballad was so recently published in the Ancient Reliques, Dr. Goldsmith has been hardy enough to publish a poem called 'The Hermit,' where the circumstances and catastrophe are exactly the same, only with this difference, that the natural simplicity and tenderness of the original are almost entirely lost in the languid smoothness and tedious paraphrase of the copy, which is as short of the merits of Mr. Percy's ballad as the insipidity of negus is to the genuine flavour of Champagne. I am, sir,

"Yours, &c.

"Detector."

This attack, supposed to be by Goldsmith's constant persecutor, the malignant Kenrick, drew from him the following note to the editor:

"Sir,

"As there is nothing I dislike so much as newspaper controversy, particularly upon trifles, permit me to be as concise as possible in informing a correspondent of yours that I recommended Blainville's Travels because I thought the book was a good one; and I think so still. I said I was told by the bookseller that it was then first published; but in that it seems I was misinformed, and my reading was not extensive enough to set me right.

"Another correspondent of yours accuses me of having taken a ballad I published some time ago from one by the ingenious Mr. Percy. I do not think there is any great resemblance between the two pieces in question. If there be any, his ballad was taken from mine. I read it to Mr. Percy some years ago; and he, as we both considered these things as trifles at best, told me, with his usual good-humour, the next time I saw him, that he had taken my plan to form the fragments of Shakspeare into a ballad of his own. He then read me his little Cento, if I may so call it, and I highly approved it. Such petty anecdotes as these are scarcely worth printing; and, were it not for the busy disposition of some of your correspondents, the public should never have known that he owes me the hint of his ballad, or that I am obliged to his friendship and learning for communications of a much more important nature.

"I am, sir, yours, &c.,

"Oliver Goldsmith.

The unexpected circulation of the 'Vicar of Wakefield' enriched the publisher, but not the author. Goldsmith no doubt thought himself entitled to participate in the profits of the repeated editions; and a memorandum, still extant, shows that he drew upon Mr. Francis Newbery, in the month of June, for fifteen guineas, but that the bill was returned dishonoured. He continued, therefore, his usual job-work for the booksellers, writing introductions, prefaces, and head and tail pieces for new works; revising, touching up, and modifying travels and voyages; making compilations of prose and poetry, and "building books," as he sportively termed it. These tasks required little labour or talent, but that taste and touch which are the magic of gifted minds. His terms began to be proportioned to his celebrity. If his price was at any time objected to, "Why, sir," he would say, "it may seem large; but then a man may be many years working in obscurity before his taste and reputation are fixed or estimated; and then he is, as in other professions, only paid for his previous labours."

At that time, however, Goldsmith was preparing to try his fortune in quite a different walk of literature. He had become acquainted with Barry, Woodward, Quick, Mr. and Mrs. Yates, and other popular actors, and, being a frequent visitor of the theatres, was at length tempted to write for the stage. He accordingly commenced his comedy of 'The Good-natured Man,' and wrought at it during the latter part of the year, whenever his hurried occupation in "book building" would give him leisure. By the spring of 1767 it was ready for representation; but now came the great difficulty with a dramatic writer, that of getting his piece acted.

With Garrick, who had the management of Drury Lane, he was not on cordial terms. Some years previously, in his 'Inquiry into Polite Learning,' he had indulged in some severe remarks upon the state of the stage in England, which wounded the sensitive feelings of Garrick, with whom, at the time, he was not acquainted. Subsequently, Goldsmith was a candidate for the secretaryship of the Society of Arts, and applied to the manager for his influence. Garrick observed that he could hardly expect his friendly exertions, after his literary attack upon the theatre. Goldsmith replied that he had indulged in no personal reflections, and had only spoken the truth. He retired without farther apology or application; failed to get the appointment, and considered Garrick hostile to him.

Times were now altered with Goldsmith: he had risen to some consequence in the public eye, and, of course, in the eye of Garrick; and, through the influence of Sir Joshua Reynolds, who thought they ought to know and might mutually serve each other, they were once more brought together, and Goldsmith's play was submitted to the manager's perusal. The conduct of Garrick was evasive, not through any lingerings of past hostility, but from scruples of delicacy. He did not think the piece likely to succeed upon the stage, and avowed that opinion to Reynolds and Johnson, but hesitated to say as much to Goldsmith, through fear of wounding his feelings. A farther misunderstanding was the result of this want of decision and frankness; and, after two or three interviews and some correspondence, Goldsmith gave up all thoughts of Drury Lane, and determined to try his fortune at the rival theatre.

In the summer of this year we find Goldsmith lodged in the quarters occasionally occupied by his friend Newbery, in Canonbury House, or Castle, as it is more popularly called. There he inhabited an old brick tower, the only remains of what had been a hunting-lodge of Queen Elizabeth, in whose time it was distant from London, and surrounded by parks and forests. In Goldsmith's time, also, it was still in the country, amid rural scenery, and a favourite nestling-place of authors, publishers, and others of the literary order. The writer of this article visited the old tower some years since, out of regard to the memory of Goldsmith. The apartment was still shown which the poet had inhabited, consisting of a sitting-room and small bedroom, with panneled wainscots and Gothic windows. The quaintness and quietude of the place were still attractive. It was one of the resorts of citizens on their Sunday walks, who would ascend to the top of the tower and amuse themselves with reconnoitring the city through a telescope. Not far from this tower were the gardens of the White Conduit House, a cockney elysium where Goldsmith used to figure in the humbler days of his fortune, but which he renounced after his rise in the world enabled him to look down with proper contempt upon these plebeian haunts. In the first edition of his Essays he speaks of a stroll in these gardens, but in an edition in after years he altered it to a stroll "in the park."

The comedy of the 'Good-natured Man' had been read in manuscript and applauded by Burke, Reynolds, and other men of eminent talents: Johnson pronounced it the best comedy that had been written since the Provoked Husband, and engaged to write the prologue. Colman, the manager of Covent Garden theatre, therefore, gladly undertook to produce it on his stage, where it was represented for the first time on the 29th January, 1768.

Goldsmith was at the theatre, watching the reception of the play and the effect of each individual scene with all the vicissitude of feeling incident to his mercurial nature. Some of the scenes met with great applause, and at such times poor Goldsmith was highly elated; others went off coldly or were condemned, and then his spirits would sink. The fourth act saved the piece; for Shuter, who had the main comic character of Croaker, was so varied and ludicrous in his execution of the scene in which he reads an incendiary letter, that he drew down thunders of applause. On his coming behind the scenes, Goldsmith greeted him with rapture; declaring that he exceeded his own idea of the character, and, by the comic richness of his colouring, made it almost as new to him as to any of the audience. On the whole, however, both the author and his friends were disappointed at the reception of the piece, and considered it a failure. Poor Goldsmith left the theatre with his towering hopes completely cut down. He endeavoured to hide his mortification, and even to assume an air of unconcern while among his associates; but, the moment he was alone with Dr. Johnson, he gave way to an almost childlike burst of grief. Johnson rebuked him with harshness for what he termed a silly affectation, saying that "no man should be expected to sympathize with the sorrows of vanity."

When Goldsmith had recovered from the blow, he, with his usual unreserve, made his past distress a subject of amusement to his friends. Dining one day, in company with Dr. Johnson, at the chaplain's table at St. James's Palace, he entertained the company with a particular and comic account of all his feelings on the night of representation, and his despair when his piece was hissed. How he went to the Literary Club; chatted gayly, as if nothing had gone amiss; and, to give a greater idea of his unconcern, sang his favourite song about an old woman tossed in a blanket seventeen times as high as the moon. . . "All this while, added he, I was suffering horrid tortures, and, had I put a bit in my mouth, I verily believe it would have strangled me on the spot, I was so excessively ill: but I made more noise than usual to cover all that; so they never perceived my not eating, nor suspected the anguish of my heart; but, when all were gone except Johnson here, I burst out a-crying, and even swore that I would never write again."

Dr. Johnson sat in amaze at the odd frankness and self-confession of his friend; and, when Goldsmith had come to a pause, "All this, doctor," said he, dryly, "I thought had been a secret between you and me; and I am sure I would not have said any thing about it for the world."

'The Good-natured Man' was performed ten nights in succession, and then occasionally; but it has always pleased more in the closet than on the stage. The profit of the author from the theatre and the publisher was about £500.

A few days before the appearance of the 'Good-natured Man,' a rival comedy by Hugh Kelly, entitled 'False Delicacy,' was produced at Drury Lane, and had a great run, probably through the favouring countenance and skilful management of Garrick. Johnson pronounced it "totally devoid of character," and it has long since passed into oblivion; yet it kept pace with its rival in its progress through the press; the booksellers announced that the first impression of three thousand copies was exhausted before two o'clock on the day of publication: four editions, amounting to ten thousand copies, were sold in the course of the season, and a public breakfast was given to Kelly at the Chapter Coffee-house, and a piece of plate presented to him by the publishers. The comparative merits of the two plays were continual subjects of discussion in green-rooms, coffee-houses, and all other places where theatrical questions were discussed. Some insinuated that Kelly had seen the manuscript of Goldsmith's play while in the hands of Garrick or elsewhere, and had borrowed some of the situations and sentiments. Some of the wags of the day took a mischievous pleasure in stirring up a feud between the rival authors. Goldsmith became nettled, though he could scarcely be termed jealous of one so far his inferior. He spoke disparagingly, though no doubt sincerely, of Kelly's play: the latter retorted. Still, when they met one day behind the scenes of Covent Garden, Goldsmith, with his customary urbanity, congratulated Kelly on his success. "If I thought you sincere, Mr. Goldsmith," replied the other abruptly, "I should thank you." Goldsmith was not a man to harbour spleen or ill-will, and soon laughed at this unworthy rivalship: but the jealousy and envy awakened in Kelly lasted through the life of his competitor, and found a vent in anonymous attacks in the newspapers, the basest resource of dastardly and malignant spirits.

Goldsmith's old enemy, Kenrick, was among the "vipers of the press," as Cumberland called them, who endeavoured on this, as on many other occasions, to detract from his well-earned fame. Poor Goldsmith was excessively sensitive to these attacks, and had not the art and self-command to conceal his feelings.

In the spring of 1768 he received the afflicting intelligence of the death of his brother Henry, then but forty-five years of age. He had led a quiet and blameless life in the scenes of his youth, fulfilling the duties of village pastor with unaffected piety, conducting the school at Lissoy with a degree of industry and ability that gave it celebrity, and acquitting himself in all the domestic duties of life with undeviating rectitude and the mildest benevolence. What probably added to the affliction of Goldsmith at the news of his death was, that he feared his brother died with some doubt upon his mind of the warmth of his affection. Goldsmith had been urged by his friends in Ireland, since his elevation in the world, to use his influence with the great, which they supposed to be all-powerful, to obtain church-preferment for his brother. He did exert himself as far as his diffident nature would permit, but without success, and was accused by some of his friends of negligence. It is not likely, however, that his amiable and estimable brother joined in the accusation.

In the middle of May, 1769, Goldsmith published his Roman History "for the use of schools and colleges;" a work written without pretension, but which, from its ease, perspicuity, good sense, and delightfully simple style, has ever since remained in the hands of young and old. It drew forth, a few years after its appearance, a most copious eulogy from Dr. Johnson, in the course of a conversation with Boswell. "Whether we take him," said Johnson, "as a poet, as a comic writer, or as an historian, he stands in the first class." Boswell.—"An historian! My dear sir, you surely will not rank his compilation of the Roman History with the works of other historians of this age." Johnson.—"Why, who are before him?" Boswell.—"Hume—Robertson—Lord Lyttleton." Johnson (his antipathy against the Scotch beginning to rise).—"I have not read Hume; but doubtless Goldsmith's History is better than the *verbiage* of Robertson, or the foppery of Dalrymple." Boswell.—"Will you not admit the superiority of Robertson, in whose history we find such penetration, such painting?" Johnson.—"Sir, you must consider how that penetration and that painting are employed. It is not history, it is imagination. He who describes what he never saw, draws from fancy. Robertson paints minds, as Sir Joshua paints faces, in a history-piece; he imagines an heroic countenance. You must look upon Robertson's work as romance, and try it by that standard. History it is not. Besides, sir, it is the great excellence of a writer to put into his book as much as his book will hold. Goldsmith has done this in his history. Now Robertson might have put twice as much in his book. Robertson is like a man who has packed gold in wool; the wool takes up more room than the gold. No, sir; I always thought Robertson would be crushed with his own weight—would be buried under his own ornaments. Goldsmith tells you shortly all you want to know: Robertson detains you a great deal too long. No man will read Robertson's cumbrous detail a second time; but Goldsmith's plain narrative will please again and again. I would say to Robertson, what an old tutor of a college said to one of his pupils, 'Read over your compositions, and, whenever you meet with a passage which you think is particularly fine, strike it out!' Goldsmith's abridgment is better than that of Lucius Florus or Eutropius; and I will venture to say, that if you compare him with Vertot in the same places of the Roman History, you will find that he excels Vertot. Sir, he has the art of compiling, and of saying everything he has to say in a pleasing manner. He is now writing a Natural History, and will make it as entertaining as a Persian tale."

The Natural History to which Johnson alluded was the 'History of Animated Nature,' which Goldsmith commenced in 1769. He was induced to engage in it by the urgent solicitations of the booksellers, who were struck by the sterling merits and captivating style of an introduction which he wrote to Brookes's Natural History. It was Goldsmith's intention originally to make a translation of Pliny, with a popular commentary; but the appearance of Buffon's work induced him to change his plan, and make use of that author for a guide and model.

Cumberland, speaking of this work, observes: "Distress drove Goldsmith upon undertakings neither congenial with his studies nor worthy of his talents. I remember him when, in his chambers in the Temple, he showed me the beginning of his 'Animated Nature;' it was with a sigh, such as genius draws when hard necessity diverts it from its bent to drudge for bread, and talk of birds, and beasts, and creeping things, which Pidock's showman would have done as well. Poor fellow, he hardly knows an ass from a mule, nor a turkey from a goose, but when he sees it on the table."

Others of Goldsmith's friends entertained similar ideas with respect to his fitness for the task, and they were apt now and then to banter him on the subject, and to amuse themselves with his easy credulity. The custom among the natives of Otaheite of eating dogs being once mentioned in company, Goldsmith observed that a similar custom prevailed in China; that a dog-butcher is as common there as any other butcher; and that, when he walked abroad, all the dogs fall on him. Johnson.—"That is not owing to his killing dogs; sir, I remember a butcher at Litchfield, whom a dog that was in the house where I lived always attacked. It is the smell of carnage which provokes this, let the animals he has killed be what they may." Goldsmith.—"Yes, there is a general abhorrence in animals at the signs of massacre. If you put a tub full of blood into a stable, the horses are likely to go mad." Johnson.—"I doubt that." Goldsmith.—"Nay, sir, it is a fact well-authenticated." Thrale.—"You had better prove it before you put it into your book on Natural History. You may do it in my stable if you will." Johnson.—"Nay, sir, I would not have him prove it. If he is content to take his information from others, he may get through his book with little trouble, and without much endangering his reputation. But if he makes experiments for so comprehensive a book as his, there would be no end to them; his erroneous assertions would fall then upon himself; and he might be blamed for not having made experiments as to every particular."

Johnson's original prediction, however, with respect to this work, that Goldsmith would make it as entertaining as a Persian tale, was verified; and though much of it was borrowed from Buffon, and but little of it written from his own observation; though it was by no means profound, and was chargeable with many errors, yet the charms of his style and the play of his happy disposition throughout have continued to render it far more popular and readable than many works on the subject of much greater scope and science. Cumberland was mistaken, however, in his notion of Goldsmith's ignorance and lack of observation as to the characteristics of animals. He was often a minute and shrewd observer, as his watching of the policy of rooks from his window overlooking the Temple Garden, and his admirable paper in the Bee on the habits of the spider, sufficiently testify.

The following extract from a letter of the venerable Judge Day, of the Irish Bench, written in 1831, speaks of Goldsmith as he was during his residence in the Temple.

"I first became acquainted with Goldsmith in 1769, the year I entered the Middle Temple, where he had chambers; it was through the introduction of my friend and namesake, Mr., afterward Sir John Day, who subsequently became judge-advocate-general in Bengal.

"The poet frequented much the Grecian Coffee-house, then the favourite resort of the Irish and Lancashire Templars; and delighted in collecting around him his friends, whom he entertained with a cordial and unostentatious hospitality. Occasionally he amused them with his flute or with whist, neither of which he played well, particularly the latter; but in losing his money he never lost his temper. In a run of bad luck and worse play, he would fling his cards upon the floor and exclaim, '*Bye-fore* George, I ought for ever to renounce thee, fickle, faithless Fortune!'

"In person he was short, about five feet five or six inches; strong, but not heavy in make; rather fair in complexion, with brown hair, such, at least, as could be distinguished from his wig. His features were plain, but not repulsive—certainly not so when lighted up by conversation. His manners were simple, natural, and perhaps, on the whole, we may say, not polished; at least without the refinement and good-breeding which the exquisite polish of his compositions would lead us to expect. He was always cheerful and animated, often, indeed, boisterous in his mirth; entered with spirit into convivial society; contributed largely to its enjoyments by solidity of information, and the naïveté and originality of his character; talked often without premeditation, and laughed loudly without restraint.

"Being then a young man, I felt myself much flattered by the notice of so celebrated a person. He took great delight in the conversation and society of Grattan, whose brilliancy in the morning of life furnished full earnest of the unrivalled splendour which awaited his meridian; and finding us dwelling together in Essex Court, near himself, where he frequently visited my immortal friend, his warm heart became naturally prepossessed towards the associate of one whom he so much admired.

"Just arrived, as I then was from College, full freighted with academic gleanings, our author did not disdain to receive from me some opinions and hints towards his Greek and Roman histories, light and superficial works, not composed for fame, but compiled for the more urgent purpose of recruiting his exhausted finances. So in truth was his 'Animated Nature.' His purse replenished by labours of this kind, the season of relaxation and pleasure took its turn in attending the theatres, Ranelagh, Vauxhall, and other scenes of gayety and amusement, which he continued to frequent as long as his supply held out. He was fond of exhibiting his muscular little person in the gayest apparel of the day, to which was added a bag wig and sword.

"This favourite costume involved him one morning in a short but comical dialogue in the Strand with two coxcombs, one of whom, pointing to Goldsmith, called to his companion, in allusion to the poet's sword, 'to look at that fly with a long pin stuck through it.' Goldsmith instantly cautioned the passengers aloud against 'that brace of disguised pickpockets;' and, having determined to teach those gentlemen that he wore a sword as well for defence from insolence as for ornament, he retired from the footpath into the coachway, which admitted of more space and freedom of action, and, half drawing his sword, beckoned to the witty gentleman, armed in like manner, to follow him; but he and his companion, thinking prudence the better part of valour, declined the invitation, and sneaked away amid the hootings of the spectators.

"Whenever his funds were dissipated—and they fled more rapidly from being the dupe of many artful persons, male and female, who practised upon his benevolence—he returned to his literary labours, and shut himself up from society to provide fresh matter for his bookseller and fresh supplies for himself."

His mode in the summer-time, when pressed by a multiplicity of undertakings, or urged to the accomplishment of some particular task, was to take country lodgings a few miles from town, generally on the Harrow or Edgeware Roads, and bury himself there for weeks and months together. Sometimes he would remain closely occupied in his room, at other times he would stroll out along the lanes and hedgerows, and, taking out paper and pencil, note down thoughts to be expanded and connected at home. In some of the choicest and sweetest moments thus snatched from his coarser labours, and spent among the beautifully rural scenes which abound in the vicinity of London, he sketched off some of the first picturings of his 'Deserted Village.'

One of his country retreats was a little cottage with a garden, pleasantly situated about eight miles from town, on the Edgeware Road, which he took in conjunction with Mr. Botts, who had chambers adjacent to his own in the Temple. A rich shoemaker of Piccadilly had been the former occupant, and had been at some expense in rural decorations; in consequence of which, Goldsmith gave it the name of "the Shoemaker's Paradise." His fellow-occupant, Mr. Botts, drove a gig, which enabled Goldsmith occasionally to partake of the convivialities of town, and return home in the evening. He and his friend, however, on one occasion had probably lingered too long at table, for in their way homeward they came near breaking their necks by driving against a post on the sidewalk, which Mr. Botts insisted was in the very middle of the broad Edgeware Road.

When circumstances prevented Goldsmith from taking summer lodgings in the country, the rural feeling, which was strong within him throughout life, called from time to time for practical gratification. His great delight on such occasions was to make up a rural party of four or five of his intimate friends, to enjoy what he humorously called "a tradesman's holyday." These would assemble at his chambers in the morning, where a plentiful and rather expensive breakfast would await them; the remains of which, with his customary benevolence, he generally gave to some poor woman in attendance. This repast ended, the party would set out on foot in high spirits, making extensive rambles by footpaths and green lanes to Blackheath, Wandsworth, Chelsea, Hampstead, Highgate, or some other pleasant resort within a few miles of London.

A simple, but gay and heartily-relished dinner at a country inn crowned the excursion, and in the evening they strolled back to town, all the better in health and spirits for a day spent in social and rural enjoyment.

These were the scenes and associates suited to the tastes and habits of Goldsmith. On these occasions he was in all his glory the "king of good fellows;" quite a different being from what he was when among the higher learned and literary circles of the metropolis. Here, too, he had his humble retainers and hangers-on, who sponged upon his generosity; for, however poor he might be, Goldsmith had always the luck of finding some one poorer than himself, to drain his scanty but ever-open purse. One of these humble companions was his occasional amanuensis, Peter Barlow; whose quaint peculiarities were subjects of amusement to Goldsmith's friends. Peter was poor but punctilious. He squared his expenses according to his means; always wore the same garb, fixed his regular expenditure for dinner at a trifling sum, which, if left to himself, he never exceeded, but which he always insisted upon paying. His oddities made him a welcome companion on the "tradesman's holydays." The dinner on these occasions always exceeded considerably his regular tariff. Peter, however, put down no more than his invariable sum, and Goldsmith made up the difference.

Another boon companion for whom the poet was occasionally content to "pay the shot" was one Glover, a fellow of some humour, of that "vagabond order" of which Goldsmith was always a little fond. Glover had originally been educated for the medical profession, but his vagabond propensities led him early to the stage. While performing at Cork he undertook, partly in jest, to restore life to the body of a malefactor who had just been executed. To the astonishment of every one, himself among the number, he succeeded. The miracle took wind. He abandoned the stage, resumed the wig and cane, and considered his fortune as secure. Unluckily, there were not many dead people to be restored to life in Ireland; his practice did not equal his expectation, so he came to London, where he continued to dabble indifferently, and rather unprofitably, in physic and literature. He was a great frequenter of the Globe and Devil taverns, where he used to amuse the company by his talent at story-telling and his powers of mimicry, giving capital imitations of Garrick, Foote, Colman, Sterne, and other public characters of the day. He seldom happened to have money enough to pay his reckoning, but was always sure to find some ready purse among those who had been amused by his humours.

He was not long in London without seeking the acquaintance of Goldsmith, who was then rising into reputation, and whose bounteous breakfast-table was becoming a convenient resort for needy authors in search of literary counsel and a hearty meal. "Our doctor," says Glover, in one of his scribblings, "our doctor, as Goldsmith was usually called, had a constant levee of his distressed countrymen, whose wants, as far as he was able, he always relieved; and he has often been known to leave himself without a guinea, in order to supply the necessities of others." We may be sure Glover was among the foremost to profit by this heedless generosity.

This vagabond genius has bequeathed us a whimsical story of one of his practical jokes upon Goldsmith, in the course of a rural excursion in the vicinity of London. They had dined at an inn on Hempstead Heights, and were descending the hill, when, in passing a cottage, they saw through the open window a party at tea. Goldsmith, who was fatigued, cast a wistful glance at the cheerful tea-table. "How I should like to be of that party," exclaimed he. "Nothing more easy," replied Glover: "allow me to introduce you." So saying, he entered the house with an air of the most perfect familiarity, though an utter stranger, and was followed by the unsuspecting Goldsmith, who supposed, of course, that he was a friend of the family. The owner of the house rose on the entrance of the strangers. The undaunted Glover shook hands with him in the most cordial manner possible, fixed his eye upon one of the company who had a peculiarly good-natured physiognomy, muttered something like a recognition, and forthwith launched into an amusing story, invented at the moment, of something which he pretended had occurred upon the road. The host supposed the newcomers were friends of his guests; the guests, that they were friends of the host. Glover did not give them time to find out the truth. He followed one droll story with another: brought his powers of mimicry into play, and kept the company in a roar. Tea was offered and accepted; an hour went off in the most sociable manner imaginable, at the end of which, Glover bowed himself and his companion out of the house with many facetious last words, leaving the host and his company to compare notes, and find out what an impudent intrusion they had experienced.

Nothing could exceed the dismay and vexation of Goldsmith when triumphantly told by Glover that it was all a hoax, and that he did not know a single soul in the house. His first impulse was to return instantly and vindicate himself from all participation in the jest; but a few words from his free and easy companion dissuaded him. "Doctor," said he, coolly, "we are unknown; you quite as much as I; if you return and tell the story, it will be in the newspapers to-morrow; nay, upon recollection, I remember in one of their offices the face of that squinting fellow who sat in the corner as if he was treasuring up my stories for future use, and we shall be sure of being exposed; let us therefore keep our own counsel."

This story was frequently afterward told by Glover with rich dramatic effect, repeating and exaggerating in conversation, and mimicking in ludicrous style the embarrassment, surprise, and subsequent indignation of Goldsmith.

In the latter part of 1768 the Royal Academy of Arts was instituted, to be under the patronage of the sovereign, and the direction of forty artists of the first rank in their several professions. In December of the following year, Dr. Johnson was appointed Professor of Ancient Literature, and Dr. Goldsmith Professor of History to the institution, mere honorary titles without any emolument. About the same time Goldsmith received notice that a small legacy had been left him by his excellent and affectionate uncle Contarine.

These circumstances called forth the following letter, containing domestic allusions of a moving nature:

"*To Mr. Maurice Goldsmith, at James Lawder's, Esq., at Kilmore, near Carrick-on-Shannon.*

"January, 1770.

"Dear Brother,

"I should have answered your letter sooner, but, in truth, I am not fond of thinking of the necessities of those I love, when it is so very little in my power to help them. I am sorry to find you are every way unprovided for; and what adds to my uneasiness is, that I have received a letter from my sister Johnson, by which I learn that she is pretty much in the same circumstances. As to myself, I believe I could get both you and my poor brother-in-law something like that which you desire; but I am determined never to ask for little things, nor exhaust any little interest I may have, until I can serve you, him, and myself more effectually. As yet, no opportunity has offered; but I believe you are pretty well convinced that I will not be remiss when it arrives.

"The king has lately been pleased to make me Professor of Ancient History in a royal academy of painting which he has just established, but there is no salary annexed; and I took it rather as a compliment to the institution than any benefit to myself. Honours to one in my situation are something like ruffles to one that wants a shirt.

"You tell me that there are fourteen or fifteen pounds left me in the hands of my cousin Lawder, and you ask me what I would have done with them. My dear brother, I would by no means give any directions to my dear worthy relations at Kilmore how to dispose of money which is, properly speaking, more theirs than mine. All that I can say is, that I entirely, and this letter will serve to witness, give up any right and title to it; and I am sure they will dispose of it to the best advantage. To them I entirely leave it; whether they or you may think the whole necessary to fit you out, or whether our poor sister Johnson may not want the half, I leave entirely to their and your discretion. The kindness of that good couple to our shattered family demands our sincerest gratitude; and, though they have almost forgotten me, yet, if good things at last arrive, I hope one day to return and increase their good-humour by adding to my own.

"I have sent my cousin Jenny a miniature picture of myself, as I believe it is the most acceptable present I can offer. I have ordered it to be left for her at George Faulkner's, folded in a letter. The face, you well know, is ugly enough, but it is finely painted. I will shortly also send my friends over the Shannon some mezzotinto prints of myself and some more of my friends here, such as Burke, Johnson, Reynolds, and Colman. I believe I have written a hundred letters to different friends in your country, and never received an answer to any of them. I do not know how to account for this, or why they are unwilling to keep up for me those regards which I must ever retain for them.

"If, then, you have a mind to oblige me, you will write often, whether I answer you or not. Let me particularly have the news of our family and old acquaintances. For instance, you may begin by telling me about the family where you reside, how they spend their time, and whether they ever make mention of me. Tell me about my mother, my brother Hodson and his son, my brother Harry's son and daughter, my sister Johnson, the family of Ballyoughter, what is become of them, where they live, and how they do. You talked of being my only brother: I don't understand you. Where is Charles? A sheet of paper occasionally filled with the news of this kind would make me very happy, and would keep you nearer my mind. As it is, my dear brother, believe me to be

"Yours most affectionately,

"Oliver Goldsmith."

Several years had now elapsed since the first publication of 'The Traveller,' and much wonder had been expressed that the great success of that poem had not excited him to farther attempts in that walk of literature. On being questioned at a public dinner given at the Royal Academy by the Earl of Lisburn, why he neglected the muses to compile histories and write novels, "My lord," said he, "by courting the muses I shall starve, but by my other labours I eat, drink, have good clothes, and can enjoy the luxuries of life." So also, on being asked by a poor writer what was the most profitable mode of exercising the pen, "My dear fellow," replied he, good-humouredly, "pay no regard to the draggle-tailed muses; for my part, I have found production in prose more sought after and better paid for."

Still, however, as has been before observed, he found golden moments to steal away from his prosaic labours and indulge the poetic vein, and, on the 26th May, 1770, was enabled to bring his 'Deserted Village' before the public.

The popularity of 'The Traveller' had prepared the way for this poem, and its sale was instantaneous and immense. The first edition was immediately exhausted; in a few days a second was issued, in a few days more a third, and, by the 16th of August, the fifth edition was hurried through the press. As is the case with popular writers, Goldsmith was his own rival, and critics were inclined to give the preference to his first poem; but, with the public at large, we believe 'The Deserted Village' has ever been the greatest favourite.[*]

Previous to the publication of 'The Deserted Village,' the bookseller gave Goldsmith in advance a note for the price agreed upon, one hundred guineas. As the latter was returning home, he met a friend, to whom he mentioned the circumstance, and who, apparently judging of poetry by quantity rather than quality, observed that it was a great sum for so small a poem. "In truth," said Goldsmith, "I think so too; it is much more than the honest man can afford or the piece is worth. I have not been easy since I received it." In fact, he actually returned the note to the bookseller, and left it to him to graduate the payment according to the success of the work. The bookseller soon repaid him in full, with many acknowledgments of his disinterestedness.

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[*] The following article, which appeared in a London periodical, shows the effect of Goldsmith's poem in renovating the fortunes of Lishoy.

"About three miles from Ballymahon, a very central town in the sister kingdom, is the mansion and village of Auburn, so called by their present possessor, Captain Hogan. Through the taste and improvement of this gentleman, it is now a beautiful spot, although fifteen years since it presented a very bare and unpoetical aspect. This, however, was owing to a cause which serves strongly to corroborate the assertion, that Goldsmith had this scene in view when he wrote his poem of 'The Deserted Village.' The then possessor, General Napier, turned all his tenants out of their farms that he might enclose them in his own private domain. Littleton, the mansion of the general, stands not far off, a complete emblem of the desolating spirit lamented by the poet, dilapidated and converted into a barrack.

"The chief object of attraction is Lishoy, once the parsonage-house of Henry Goldsmith, that brother to whom the poet dedicated his 'Traveller,' and who is represented as the village pastor,

> 'Passing rich with forty pounds a-year.'

"When I was in the country, the lower chambers were inhabited by pigs and sheep, and the drawing-rooms by oats. Captain Hogan, however, has, I believe, got it since into his possession, and has, of course, improved its condition.

"Though at first strongly inclined to dispute the identity of Auburn, Lishoy House overcame my scruples. As I clambered over the rotten gate, and crossed the grass-grown lawn or court, the tide of association became too strong for casuistry: here the poet dwelt and wrote, and here his thoughts fondly recurred when composing his 'Traveller' in a foreign land. Yonder was the decent church, that literally 'topped the neighbouring hill.' Before me lay the little hill of Knockrue, on which he declares, in one of his letters, he had rather sit with a book in hand than mingle in the proudest assemblies. And, above all, startingly true, beneath my feet was

> 'Yonder copse, where once the garden smiled,
> And still where many a garden-flower grows wild.'

"A painting from the life could not be more exact. 'The stubborn currant-bush' lifts its head above the rank grass, and the proud hollyhock flaunts where its sisters of the flower-knot are no more.

"In the middle of the village stands the old 'hawthorn-tree,' built up with masonry to distinguish and preserve it; it is old and stunted, and suffers much from the depredations of post-chaise travellers, who generally stop to procure a twig. Opposite to it is the village alehouse, over the door of which swings 'The Three Jolly Pigeons.' Within everything is arranged according to the letter:

> 'The white-wash'd wall, the nicely-sanded floor,
> The varnish'd clock that click'd behind the door;
> The chest, contrived a double debt to pay,
> A bed by night, a chest of drawers by day;
> The pictures placed for ornament and use,
> The twelve good rules, the royal game of goose.'

"Captain Hogan, I have heard, found great difficulty in obtaining 'the twelve good rules,' but at length purchased them at some London bookstall to adorn the whitewashed parlour of 'The Three Jolly Pigeons.' However laudable this may be, nothing shook my faith in the reality of Auburn so much as this exactness, which had the disagreeable air of being got up for the occasion. The last object of pilgrimage is the quondam habitation of the schoolmaster,

> 'There, in his noisy mansion, skill'd to rule.'

It is surrounded with fragrant proofs of its identity in

> 'The blossom'd furze, unprofitably gay.'

There is to be seen the chair of the poet, which fell into the hands of its present possessors at the wreck of the parsonage-house; they have frequently refused large offers of purchase; but more, I dare say, for the sake of drawing contributions from the curious than from any reverence for the bard. The chair is of oak, with back and seat of cane, which precluded all hopes of a secret drawer, like that lately discovered in Gay's. There is no fear of its being worn out by the devout earnestness of sitters—as the cocks and hens have usurped undisputed possession of it, and protest most clamorously against all attempts to get it cleansed or to seat one's self.

"The controversy concerning the identity of this Auburn was formerly a standing theme of discussion among the learned of the neighbourhood; but, since the pros and cons have been all ascertained, the argument has died away. Its abettors plead the singular agreement between the local history of the place and the Auburn of the poem, and the exactness with which the scenery of the one answers to the description of the other. To this is opposed the mention of the nightingale,

> 'And fill'd each pause the nightingale had made;'

About the same time he showed another instance of the magnanimity and independence of his spirit in matters of mere pecuniary profit. He was well known to be straitened in circumstances, and that, with all his varied exertions, his pen could but ill supply the expenses of his generous hand. The ministry was at that time assailed by a variety of powerful writers, such as Junius and Wilkes, and was anxious to obtain literary support. Dr. Scott, author of Anti-Sejanus and other political tracts in support of Lord North's administration, was sent to negotiate with Goldsmith. "I found him," said the doctor, "in a miserable set of chambers in the Temple; I told him my authority; I told him I was empowered to pay most liberally for his exertions. Would you believe it? he was so absurd as to say, 'I can earn as much as will supply my wants without writing for any party; the assistance, therefore, you offer is unnecessary to me,' and so I left him," added Dr Scott, "in his garret." Who does not admire the independent spirit of Goldsmith? Who does not smile at the astonishment of the political hireling?

Shortly after 'The Deserted Village,' Goldsmith published his Life of Parnell. Johnson spoke slightingly of it as poor, and Goldsmith himself acknowledges the scantiness of his materials; yet, in so doing, he uses a simile which, for beauty of imagery and felicity of language, is enough of itself to stamp a value upon the essay.

"Such," says he, "is the very unpoetical detail of the life of a poet. Some dates and some few facts, scarcely more interesting than those that make the ornaments of a country tombstone, are all that remain of one whose labours now begin to excite universal curiosity. A poet, while living, is seldom an object sufficiently great to attract much attention; his real merits are known but to a few, and these are generally sparing in their praises. When his fame is increased by time, it is then too late to investigate the peculiarities of his disposition; *the dews of the morning are past, and we vainly try to continue the chase by the meridian splendour.*"

The slovenliness of dress for which Johnson, on his first interview with Goldsmith, had given him a practical reproof, was by no means to be laid to his charge since he had become elevated into polite society. On the contrary, if we may judge from certain anecdotes concerning him, and from some of his tailors' bills still extant, he was prone to be expensive, if not tasteful in his attire, and at times, with great self-complacency, to sport his ungainly figure in the sunshine in Temple Gardens, arrayed with a finery that provoked the merriment of his friends. Boswell has rendered his peach-coloured dress famous. Goldsmith, with Johnson, Reynolds, Garrick, and others, were invited to dine with him, and they were awaiting the arrival of another guest. "Goldsmith," says Boswell, "to divert the tedious minutes, strutted about, bragging of his dress, and, I believe, was seriously vain of it, for his mind was undoubtedly prone to such impressions. 'Come, come,' said Garrick, 'talk no more of that. You are perhaps the worst—eh, eh?' Goldsmith was eagerly attempting to interrupt him, when Garrick went on, laughing ironically. 'Nay, you will always *look* like a gentleman; but I am talking of your being well or *ill dressed.*' 'Well, let me tell you,' said Goldsmith, 'when the tailor brought home my bloom-coloured coat, he said, "Sir, I have a favour to beg of you; when anybody asks you who made your clothes, be pleased to mention John Filby, at the Harrow, in Water Lane."' 'Why, sir,' cried Johnson, 'that was because he knew the strange colour would attract crowds to gaze at it, and thus they might hear of him, and see how well he could make a coat of so absurd a colour.'"

According to his tailors' bills, he had sometimes four and five full suits in the course of a year, besides separate articles of dress. Among the items we find a green half-trimmed frock and breeches, lined with silk; queen's-blue dress-suit; half-dress suit of ratteen, lined with satin; Tyrian bloom satin grain and garter-blue silk breeches, &c. Honest John Filby, as he used to term him, was his tailor for many years, and was always punctually paid.

Goldsmith had of course been brought into a higher sphere of society than he had originally been accustomed to, but he always preferred those easy domestic circles where there was little of the etiquette of polished life, and where he

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there being no such bird in the island. The objection is slighted, on the other hand, by considering the passage as a mere poetical license: 'Besides,' say they, 'the robin is the Irish nightingale.' And if it be hinted how unlikely it was that Goldsmith should have laid the scene in a place from which he was and had been so long absent, the rejoinder is always, 'Pray, sir, was Milton in hell when he built Pandemonium?'

"The line is naturally drawn between; there can be no doubt that the poet intended England by

'The land to hast'ning ills a prey,
Where wealth accumulates and men decay.'

But it is very natural to suppose that, at the same time, his imagination had in view the scenes of his youth, which give such strong features of resemblance to the picture."

could indulge his playful and occasionally grotesque humour. One of his social resorts was the family of a Mr. Seguin, an Irish merchant of literary tastes, who had country lodgings near his rural retreat at Edgeware. In the bosom of this family he would completely unbend and play the boy. He was ready for anything that was going forward: conversation, music, or a game of romps. He prided himself upon his dancing, and would walk a minuet with Mrs. Seguin, to the infinite amusement of herself and the children, whose shouts of laughter he bore with perfect good-humour. He would sing Irish songs, and the Scotch ballad of Johnny Armstrong. He took the lead in the children's sports of blind man's buff, hunt the slipper, &c., or in their games at cards, and was the most noisy of the party, affecting to cheat and to be excessively eager to win; while with children of smaller size he would turn the hind part of his wig before, and play all kinds of tricks to amuse them.

"I was only five years old," says the late George Colman, "when Goldsmith one evening, while he was drinking coffee with my father, took me on his knee and began to play with me, which amiable act I returned with a very smart slap in the face; it must have been a tingler, for I left the marks of my little spiteful paw upon his cheek. This infantile outrage was followed by summary justice, and I was locked up by my father in an adjoining room, to undergo solitary imprisonment in the dark. Here I began to howl and scream most abominably. At length a friend appeared to extricate me from jeopardy; it was the good-natured doctor himself, with a lighted candle in his hand and a smile upon his countenance, which was still partially red from the effects of my petulance. I sulked and sobbed, and he fondled and soothed until I began to brighten. He seized the propitious moment, placed three hats upon the carpet, and a shilling under each; the shillings, he told me, were England, France, and Spain. 'Hey, presto, cockolorum!' cried the doctor, and, lo! on uncovering the shillings, they were all found congregated under one. I was no politician at the time, and therefore might not have wondered at the sudden revolution which brought England, France, and Spain all under one crown; but, as I was also no conjuror, it amazed me beyond measure. From that time, whenever the doctor came to visit my father,

> 'I pluck'd his gown to share the good man's smile;'

a game of romps constantly ensued, and we were always cordial friends and merry playfellows."

One of the most agreeable additions to Goldsmith's circle of intimacy was the family of a Captain Horneck, with whom he had become acquainted at the house of Sir Joshua Reynolds. Mrs. Horneck and her two daughters were elegant and accomplished women, and the young ladies were remarkable for great beauty; their society, therefore, was much sought by several distinguished men of the day. Their attention had first been attracted to Goldsmith as a man of genius, their kind regard had subsequently been won by his honest simplicity and buoyant good-humour, and an intimacy ensued that continued uninterrupted for the remainder of his life. In the latter part of July, 1770, Goldsmith made a six weeks' excursion to Paris in company with these ladies. The following letter to Sir Joshua Reynolds was written soon after landing at Calais:

"*To Sir Joshua Reynolds.*

"MY DEAR FRIEND,

"We had a very quick passage from Dover to Calais, which we performed in three hours and twenty minutes, all of us extremely sea-sick, which must necessarily have happened, as my machine to prevent sea-sickness was not completed. We were glad to leave Dover, because we hated to be imposed upon; so were in high spirits at coming to Calais, where we were told that a little money would go a great way.

"Upon landing two little trunks, which was all we carried with us, we were surprised to see fourteen or fifteen fellows all running down to the ship to lay their hands upon them; four got under each trunk, the rest surrounded and held the hasps; and in this manner our little baggage was conducted, with a kind of funeral solemnity, till it was safely lodged at the custom-house. We were well enough pleased with the people's civility till they came to be paid; every creature that had the happiness of but touching our trunks with their finger, expected sixpence; and they had so pretty and civil a manner of demanding it, that there was no refusing them.

"When we had done with the porters, we had next to speak with the custom-house officers, who had their pretty civil way too. We were directed to the Hôtel d'Angleterre, where a valet-de-place came to offer his service, and spoke to me ten minutes before I once found out that he was speaking English. We had no occasion for his services, so we gave him a little money because he spoke English, and because he wanted it. I cannot help mentioning another circumstance: I bought a new riband for my wig at Canterbury, and the barber at Calais broke it in order to gain sixpence by buying me a new one."

An incident which occurred in the course of this tour has been tortured by that literary magpie, Boswell, into a proof of Goldsmith's absurd jealousy of any admiration shown to others in his presence. While stopping at a hotel in Lisle, they were drawn to the windows by a military parade in front. The extreme beauty of the Miss Hornecks immediately attracted the attention of the officers, who broke forth with enthusiastic speeches and compliments intended for their ears. Goldsmith was amused for a while, but at length affected impatience at this exclusive admiration of his beautiful companions, and exclaimed, with mock severity of aspect, "Elsewhere I also would have my admirers."

It is difficult to conceive the obtuseness of intellect necessary to misconstrue so obvious a piece of mock petulance and dry humour into an instance of mortified vanity and jealous self-conceit.

Goldsmith jealous of the admiration of a group of gay officers for the charms of two beautiful young women! This even out-Boswells Boswell; yet this is but one of several similar absurdities, evidently misconceptions of Goldsmith's peculiar vein of humour, by which the charge of envious jealousy has been attempted to be fixed upon him.

The following letter to Sir Joshua Reynolds was subsequently written:

"*To Sir Joshua Reynolds.*

"Paris, July 29 (1770).

"MY DEAR FRIEND,

"I began a long letter to you from Lisle, giving a description of all that we had done and seen, but, finding it very dull, and knowing that you would show it again, I threw it aside and it was lost. You see by the top of this letter that we are at Paris, and (as I have often heard you say) we have brought our own amusement with us, for the ladies do not seem very fond of what we have yet seen.

"With regard to myself, I find that travelling at twenty and at forty are very different things. I set out with all my confirmed habits about me, and can find nothing on the Continent so good as when I formerly left it. One of our chief amusements here is scolding at everything we meet with, and praising everything and every person we left at home. You may judge, therefore, whether your name is not frequently bandied at table among us. To tell you the truth, I never thought I could regret your absence so much as our various mortifications on the road have often taught me to do. I could tell you of disasters and adventures without number; of our lying in barns, and of my being half-poisoned with a dish of green pease; of our quarrelling with postillions, and being cheated by our landladies; but I reserve all this for a happy hour which I expect to share with you on my return.

"I have little to tell you more but that we are at present all well, and expect returning when we have stayed out one month, which I did not care if it were over this very day. I long to hear from you all, how you yourself do, how Johnson, Burke, Dyer, Chamier, Colman, and every one of the club do. I wish I could send you some amusement in this letter, but I protest I am so stupified by the air of this country (for I am sure it cannot be natural) that I have not a word to say. I have been thinking of the plot of a comedy, which shall be entitled 'A Journey to Paris,' in which a family shall be introduced with a full intention of going to France to save money. You know there is not a place in the world more promising for that purpose. As for the meat of this country, I can scarce eat it; and, though we pay two good shillings a-head for our dinner, I find it all so tough that I have spent less time with my knife than my picktooth. I said this as a good thing at table, but it was not understood. I believe it to be a good thing.

"As for our intended journey to Devonshire, I find it out of my power to perform it; for, as soon as I arrive at Dover, I intend to let the ladies go on, and I will take a country lodging somewhere near that place in order to do some business. I have so outrun the constable that I must mortify a little to bring it up again. For God's sake, the night you receive this, take your pen in your hand and tell me something about yourself and myself, if you know of anything that has happened. About Miss Reynolds, about Mr. Bickerstaff, my nephew, or anybody that you regard. I beg you will send to Griffin the bookseller to know if there be any letters left for me, and be so good as to send them to me at Paris. They may perhaps be left for me at the Porter's Lodge, opposite the pump in Temple Lane. The same messenger will do. I expect one from Lord Clare, from Ireland. As for the others, I am not much uneasy about.

"Is there anything I can do for you at Paris? I wish you would tell me. The whole of my own purchases here is one silk coat, which I have put on, and which makes me look like a fool. But no more of that. I find that Colman has gained his lawsuit. I am glad of it. I suppose you often meet. I will soon be among you, better pleased with my situation at home than I ever was before. And yet I must say, that if anything could make France pleasant, the very good women with whom I am at present would certainly do it. I could say more about that, but I intend showing them the letter before I send it away. What signifies teasing you longer with moral observations, when the business of my writing is over? I have one thing only more to say, and of that I think every hour in the day, namely, that I am your most sincere and most affectionate friend,

"OLIVER GOLDSMITH."

"Direct to me at the Hotel de Danemarc
Rue Jacob, Fauxbourg St. Germains."

One of Goldsmith's fellow-travellers was a Mr. Hickey, a bustling attorney, who, being well acquainted with Paris, played the part of cicerone on all occasions. He and Goldsmith did not relish each other, and they had several petty altercations. The lawyer was probably too much a man of business and method for the careless poet, and had not the literary taste and feeling to appreciate his merits.

Goldsmith subsequently gave a good-humoured sketch of Hickey in his poem of "the Retaliation."

"Here Hickey reclines, a most blunt, pleasant creature,
And slander itself must allow him good nature;
He cherish'd his friend, and he relish'd a bumper,
Yet one fault he had, and that one was a thumper.
Perhaps you may ask if the man was a miser;
I answer, No, no, for he always was wiser;
Too courteous, perhaps, or obligingly flat,
His very worst foe can't accuse him of that;
Perhaps he confided in men as they go,
And so was too foolishly honest? Ah no!
Then what was his failing? Come, tell it, and burn ye—
He was, could he help it? a special attorney."

One of the few remarks extant made by Goldsmith during this tour is the following, of whimsical import, in his 'Animated Nature:'

"In going through the towns of France some time since, I could not help observing how much plainer their parrots spoke than ours, and how very distinctly I understood their parrots speak French, when I could not understand our own, though they spoke my native language. I at first ascribed it to the different qualities of the two languages, and was for entering into an elaborate discussion on the vowels and consonants; but a friend that was with me solved the difficulty at once, by assuring me that the French women scarce did anything else the whole day than sit and instruct their feathered pupils; and that the birds were thus distinct in their lessons in consequence of continual schooling."

We have one more anecdote of this tour, which illustrates a little harmless vanity with respect to personal activity of which he stands accused. "Being with a party at Versailles viewing the water-works, a question arose among the gentlemen present whether the distance from whence they stood to one of the little islands was within the compass of a leap. Goldsmith maintained the affirmative; but, being bantered on the subject, and remembering his former prowess as a youth, attempted the leap, but, falling short, descended into the water, to the great amusement of the company."

His tour does not seem to have left in his memory the most fragrant recollections; for, being asked after his return whether travelling on the Continent repaid "an Englishman for the privations and annoyances attendant on it," he replied, "I recommend it by all means to the sick if they are without the sense of *smelling*, and to the poor if they are without the sense of *feeling*; and to both if they can discharge from their minds all idea of what in England we term comfort."

It is needless to say that the universal improvement in the art of living on the Continent has at the present day taken away the force of Goldsmith's reply, though even at the time it was more humorous than correct.

On his return to England he received the melancholy tidings of the death of his mother. Notwithstanding the fame as an author to which he had attained, she seems to have been disappointed in her early expectations from him. Like others of his family, she had been more vexed by his early irregularities than by his proofs of genius; and in subsequent years, when he had risen to fame and to intercourse with the great, had been annoyed at the ignorance of the world and want of management which prevented him from pushing his fortune. Goldsmith had always, however, been an affectionate son, and in the latter years of her life, when she had become blind, contributed from his precarious resources to prevent her from feeling want.

About this time, the friendship that had so long subsisted between Goldsmith and Dr. Percy was suddenly interrupted and almost destroyed by a dispute as to the authenticity of Rowley's poems. Percy maintained that they were entirely the productions of Chatterton, while Goldsmith, considering the merit of the poetry, the acquaintance with life and the human heart displayed in them, the antique quaintness of the language, and the familiar knowledge of historical events of their supposed day, was of opinion that they could not be the works of a boy of sixteen, of narrow education, and confined to the duties of an attorney's office; but must be the genuine productions of Rowley. So firmly was Goldsmith persuaded of this fact, that on one occasion, when dining at the Royal Academy, he spoke with rapture of them as a treasure of old English poetry wonderfully brought to light. Johnson, who was present, laughed at his enthusiasm, and Horace Walpole assured him he had for some time known of the treasure and its discoverer, and might have had the honour of ushering them to the learned world; "but, though Goldsmith's credulity diverted me," says he, "my mirth was soon dashed; for, on asking about Chatterton, he told me he had been in London and had destroyed himself."

In the following year, 1771, Goldsmith produced his History of England, in four volumes. It possessed the same kind of merit as his other historical compilations; a clear, succinct narrative, a simple, easy, and graceful style, and an agreeable arrangement of facts; but was not remarkable for either depth of observation or minute accuracy of research. Many passages were translated with little, if any alteration from his 'Letters from a Nobleman to his Son' on the same subject. The work was well-received, and, like his other historical writings, has kept its ground in English literature.

In the spring of this year he paid a visit to Lord Clare at Bath, in the course of which a whimsical blunder occurred. Lord Clare and the Duke of Northumberland had houses next to each other, of similar architecture. Returning home one morning from an early walk, Goldsmith, in one of his frequent fits of absence, mistook the house, and walked up into the duke's dining-room, where he and the duchess were about to sit down to breakfast. Goldsmith, still supposing himself in the house of Lord Clare, and that they were visitors, made them an easy salutation, being acquainted with them, and threw himself on a sofa in the lounging manner of a man perfectly at home. The duke and duchess soon perceived his mistake, and, while they smiled internally, endeavoured, with the considerateness of well-bred people, to prevent any awkward embarrassment. They accordingly chatted sociably with him about matters in Bath, until, breakfast being served, they invited him to partake. The truth at once flashed upon poor heedless Goldsmith; he started up from his free-and-easy position, made a confused apology for his blunder, and would have retired perfectly disconcerted had not the duke and duchess treated the whole as a lucky occurrence to throw him in their way, and exacted a promise from him to dine with them.

On returning from his visit to Lord Clare, he shut himself up at one of his country retreats, and set himself seriously to work to write another comedy. The following extract from a letter to Bennet Langton gives a picture of a comic author in the process of manufacturing jokes and merry scenes:

"My dear Sir,

"Since I had the pleasure of seeing you last, I have been almost wholly in the country at a farmer's house, quite alone, trying to write a comedy. It is now finished; but when and how it will be acted, or whether it will be acted at all, are questions I cannot resolve. * * * * Johnson has been down on a visit to his old haunts at Mrs. Thrale's. Burke is a farmer, *en attendant*, a better place. Every soul is a visiting about and merry but myself, and that is hard too, as I have been trying these three months to do something to make people laugh. There I have been strolling about the hedges, studying jests with a most tragical countenance. The Natural History is about half finished, and I will shortly finish the rest. God knows I am tired of this kind of finishing, which is but bungling work; and that not so much my fault as the fault of my scurvy circumstances. * * * * I have published an abridgment of the 'History of England,' for which I have been a good deal abused in the newspapers for betraying the liberties of the people. God knows I had no thought for or against liberty in my head; my whole aim being to make a book of a decent size, that, as Squire Richard says, would do no harm to nobody."

We have some farther traditional anecdotes of Goldsmith and his doings during the same year. In August, Miss Catharine Horneck, one of his beautiful fellow-travellers, was married to Henry William Bunbury, Esq., celebrated for the humorous productions of his pencil. Goldsmith shortly afterward made a visit to the newly-married couple, at their seat at Barton, in Suffolk, and the following particulars, related by one of the inmates of the mansion, present him in all the amiable and whimsical peculiarities of his character.

"While at Barton his manners were always playful and amusing, taking the lead in promoting any scheme of innocent mirth, and usually prefacing the invitation by, 'Come, now, and let us play the fool a little.' At cards, which was commonly a round game and the stake small, he was always the most noisy, affected great eagerness to win, and teased his opponents of the gentler sex with continual jest and banter on their want of spirit in not risking the hazards of the game. But one of his most favourite enjoyments was to romp with children, when he threw off all reserve, and seemed one of the most joyous of the group.

"His simplicity of manners made him occasionally the object of tricks of the jocular kind to other visitors of the house. Being at all times gay in dress, he made his appearance at the breakfast table in a smart black silk coat with an expensive pair of ruffles; the coat some one contrived to soil, and it was sent to be cleansed; but, either by accident, or probably design, the day after it came home, the sleeves became daubed with paint, which was not discovered until the ruffles also, to his great mortification, were irretrievably disfigured.

"He always wore a wig, a peculiarity which those who judge of his appearance only from the fine poetical head by Reynolds, would not suspect; and on one occasion some person contrived seriously to injure this important adjunct to dress. It was the only one he had in the country, and the misfortune seemed irreparable until the services of Mr. Bunbury's valet were called in, who, however, performed his functions so indifferently that poor Goldsmith's appearance became the signal for a general smile.

"On another occasion, some difference of opinion having arisen with Lord Harrington respecting the depth of a pond, the poet remarked that it was not so deep but that, if anything valuable was to be found at the bottom, he would not hesitate to pick it up. His lordship, after some banter, threw in a guinea; Goldsmith, not to be outdone in this kind of bravado, in attempting to fulfil his promise without getting wet, accidentally fell in, to the amusement of all present, but persevered, brought out the money, and kept it, remarking that he had abundant objects on whom to bestow any farther proofs of his lordship's whim or bounty.

"His benevolence was unquestionable, and his countenance bore every trace of it. He was a very plain man; but, had he been much more so, it was impossible not to love and respect his goodness of heart, which broke out upon every occasion; no one that knew him intimately could avoid admiring and loving his good qualities. They accused him of envy, but it certainly was not envy in the usual sense of that word:

he was jealous, perhaps, of giving praise where he thought praise was not due; but I am sure that, on many occasions, from the peculiar manner of his humour and assumed frown of countenance, what was often uttered in jest was mistaken by those that did not know him for earnest.

"The expression of his countenance is most happily caught in one of the sketches of Mr. Bunbury, which gives the head with admirable fidelity as he actually lived among us; nothing can exceed its truth.

"There are others by the same gentleman, executed in a sportive vein, and therefore caricatured. The head by Reynolds is a fine portrait, and likewise conveys a good idea of his face; it was painted as a fine poetical head for the admiration of posterity; but, as it is divested of his wig, and with the shirt collar open, it was not the man as seen in daily life. This, however, detracts nothing from the merit of the painting of that great artist and amiable man, whom, from an early period till his death, I had the honour to number among my most particular friends.

"One of the means by which he amused us was his songs, chiefly of the comic kind, which were sung with some taste and humour; several, I believe, were of his own composition, and I regret that I neither have copies, which might have been readily procured from him at the time, nor do I remember their names."

In 1772 Goldsmith resumed his labours at his 'Animated Nature,' and to be uninterrupted in his occupations, again secluded himself in the farm-house.

"Goldsmith," writes Boswell in his memoirs, "told us that he was now busy in writing a Natural History; and that he might have full leisure for it, he had taken lodgings at a farmer's house near to the six-mile stone on the Edgeware Road, and had carried down his books in two returned postchaises. He said he believed the farmer's family thought him an odd character, similar to that in which the *Spectator* appeared to his landlady and her children; he was *The Gentleman*. Mr. Mickle, the translator of the Lusiad, and I went to visit him at this place a few days afterward. He was not at home; but, having a curiosity to see his apartment, we went in, and found curious scraps of descriptions of animals scrawled upon the wall with a black-lead pencil."

The farm-house in question is still in existence, though much altered. It stands upon a gentle eminence in Hyde Lane, commanding a pleasant prospect towards Hendon. The room is still pointed out in which 'She Stoops to Conquer' was written; a convenient and airy apartment, up one flight of stairs. Goldsmith spent most of his time in his room writing, where his meals were generally sent to him. Sometimes he strolled about the fields, or was seen loitering, and reading, and musing under the hedges. He read much at night, being subject to fits of wakefulness. He was noted here, as everywhere else, for his charitable feelings. No beggar applied to him in vain, and he evinced on all occasions great commiseration for the poor.

He was visited here by Sir Joshua Reynolds, Sir William Chambers, Hugh Boyd, the reputed writer of Junius, and other distinguished characters. He gave occasionally, though rarely, a dinner-party; and on one occasion, when his guests were detained by a thunder shower, he got up a dance, and carried the merriment late into the night.

As usual, he was the promoter of hilarity among the young, and at one time took the children of the house to see a company of strolling players at Hendon. The greatest amusement to the party, however, was derived from his own jokes on the road and his comments on the performance, which produced infinite laughter among his youthful companions.

We cannot refrain from subjoining the following testimonial to the benevolence of Goldsmith, and his disposition, though poor himself, to help those who were still poorer. It is from one Dr. M'Veagh M'Donnell, a man of classical attainments, who afterward rose to some degree of prosperity.

"It was in the year 1772 that the death of my elder brother in London, on our way to Ireland, left me in a most forlorn situation; I was then about eighteen; I possessed neither friends nor money, nor the means of getting to Ireland, of which or of England I knew scarcely anything, from having so long resided in France. In this situation I had strolled about for two or three days considering what to do, but unable to come to any determination, when Providence directed me to the Temple Gardens. I threw myself on a seat, and, willing to forget my miseries for a moment, drew out a book; that book was a volume of Boileau. I had not been there long when a gentleman, strolling about, passed near me, and observing, perhaps, something Irish or foreign in my garb or countenance, addressed me; 'Sir, you seem studious; I hope you find this a favourable place to pursue it.' 'Not very studious, sir; I fear it is the want of society that brings me hither; I am solitary and unknown in this metropolis;' and a passage from Cicero—Oratio pro Archia—occurring to me, I quoted it: 'Hæc studia pernoctant nobiscum, perigrinantur, rusticantur.' 'You are a scholar too, sir, I perceive.' 'A piece of one, sir; but I ought still to have been in the college where I had the good fortune to pick up the little I know.' A good deal of conversation ensued; I told him part of my history, and he, in return, gave his address in the Temple, desiring me to call soon, from which, to my infinite surprise and gratification, I found that the person who thus seemed to take an interest in my fate was my countryman, and a distinguished ornament of letters.

"I did not fail to keep the appointment, and was received in the kindest manner. He told me, smilingly, that he was not rich; that he could do little for me in direct pecuniary aid, but would endeavour to put me in the way of doing something for myself; observing, that he could at least furnish me with advice not wholly useless to a young man placed in the heart of a great metropolis. 'In London,' he continued, 'nothing is to be got for nothing: you must work; and no man who chooses to be industrious need be under obligations to another, for here labour of every kind commands its reward. If you think proper to assist me occasionally as amanuensis, I shall be obliged, and you will be placed under no obligation, until something more permanent can be secured for you.' This employment, which I pursued for some time, was to translate passages from Buffon, which was abridged or altered, according to circumstances, for his Natural History.

"I think it was generally believed by his acquaintance," continues Dr. M'Donnell, "that he graduated at Louvain; that is my impression. Perhaps it may have been at Padua, for that university had Irish professors; so had Louvain; also Manheim; and likewise the College of Maria Theresa at Brussels.

"It has been said he was irritable. Such may have been the case at times; nay, I believe it was so; for, what with the continual pursuit of authors, printers, and booksellers, and occasional pecuniary embarrassments, few could have avoided exhibiting similar marks of impatience. But it was never so towards me. I saw him only in his bland and kind moods, with a flow, perhaps an overflow, of the milk of human kindness for all who were in any manner dependent upon him. I looked upon him with awe and veneration, and he upon me as a kind parent upon a child.

"His manner and address exhibited much frankness and cordiality, particularly to those with whom he possessed any degree of intimacy. His good-nature was equally apparent. You could not dislike the man, although several of his follies and foibles you might be tempted to condemn. He was generous and inconsiderate: money with him had little value.

"I was abroad at the time of his death, and wept bitterly when the intelligence first reached me. A blank came over my heart as if I had lost one of my nearest relatives, and was followed for some days by a feeling of despondency. Poor Goldsmith was himself subject to fits of depression, as I heard from those around him.

"After settling in England I had frequent opportunities of hearing much of my old patron from several of his surviving acquaintance, whom I met at the house of Dr. Prendergast, an Irish physician, then resident at Richmond, who had made a fortune in Jamaica. Among others with whom we recalled his character and memory with fondness were Richard Burke; Captain Higgins, who had been an officer of marines, and is mentioned in the Haunch of Venison, and who, I believe, was Goldsmith's companion when he beat Evans the bookseller; Mr. Hickey, who has a place in Retaliation, a shrewd, quick, careless, but seemingly warm-hearted man; the Rev. Mr. East, once editor of the World; and my old friend Tom English, a man of talents, but also, so often the attendant of talents improvident, for which he paid the usual tax of neglect and poverty in the decline of life. He had been, if I mistake not, a college friend of Edmund Burke; at any rate, he was patronised by him, and, upon the accession of the latter to parliament, English conducted the Annual Register under his direction, or, at least, those parts which merely required compilation. I do not believe he wrote the historical articles in that work. He never expressly laid claim to them in my hearing, though willing enough, like other persons, to have his friends think well of his abilities; but he has told me that, when pressed by occasional pecuniary difficulties, Burke wrote political articles and presented them to him to dispose of for his own advantage. The connexion between them was certainly at one time intimate. English would retire to the 'Spaniard,' a favourite house of country resort at that time at Hampstead, or some other tavern in the neighbourhood of London, and remain for some time without intimating his place of retreat, during which, to my knowledge, messengers from the Burkes used to be in search of him. The last time I saw him was at a house in Orange-street, Leicester Square, about the year 1799, or perhaps a year or two earlier; and there, I believe, he soon afterward died.

"I recollect meeting Mr. Cradock, another friend of Goldsmith, at Paris many years ago, in something of the character of what appeared to me then a distressed gentleman. He seemed a friendly and unassuming man. I had several conversations with him respecting the poet, for whose memory he professed a warm affection. I remember he told me that once, when in conversation with him, the latter complained much of the attempts made by inferior writers, and by others who could scarcely come under that denomination, not only to abuse and depreciate his writings, but to render him ridiculous as a man; perverting every harmless sentiment and action into charges of absurdity, malice, or folly, and concluding with, 'Sir, I am as a lion baited with curs.' These remarks were probably levelled at Dr. Johnson and others of *his friends*, of whose sarcastic remarks on his conversation and manners he could not be ignorant; and it was, perhaps, one of the strongest proofs of good-nature and forbearance, that he submitted not only to the savage reproofs of one who indeed was his superior in some respects, but to the insolence or impertinence of many others

inferiors either as good men or as able
."

gh Goldsmith had finished his new comedy
l, he could not get it on the stage till
1773. No one uninitiated in the internal
vrings of a theatre, that little world of
nd trickery, can have any idea of the
es and perplexities multiplied in the way
most eminent and successful author, by
smanagement of managers, the jealousies
rigues of rival authors, and the fantastic
pertinent caprices of actors. A long,
negotiation took place between him and
, manager of Covent Garden, who started
ty of objections, and returned the manu-
o him, with the blank leaves scored with
n and suggested alterations. Goldsmith's
insisted they were trivial and contemp-
d that Colman, being a dramatic writer
, was actuated by jealousy. The play was
bmitted to Garrick, who displayed equal
on with his rival manager, and forbore to
lirect answer. By Johnson's advice, the
was again submitted to Colman, but was
d in doubt. We may judge of poor Gold-
anxiety by the following letter to Colman:

"*To George Colman, Esq.*

DEAR SIR,
treat you'll relieve me from that state of
e in which I have been kept for a long
Whatever objections you have made or
ke to my play, I will endeavour to remove
t argue about them. To bring in any
dges either of its merits or faults I can
ubmit to. Upon a former occasion, when
er play was before Mr. Garrick, he offered
g me before Mr. Whitehead's tribunal,
efused the proposal with indignation; I
shall not experience as harsh treatment
u as from him. I have, as you know, a
um of money to make up shortly; by
g my play, I can readily satisfy my
that way; at any rate, I must look
o some certainty to be prepared. For
ke take the play, and let us make the
it, and let me have the same measure, at
hich you have given as bad plays as mine.
"I am your friend and servant,
"OLIVER GOLDSMITH."

great difficulty and delay, Colman at
agreed to bring the play out at Covent
; though he was ungenerous, or, at least,
et enough publicly to express his opinion
would not reach a second representation.
indled and dwindled," he said, "and at
at out like the snuff of a candle." Two
nost popular actors, to whom the parts of
Marlow and Tony Lumpkin were assigned,
l to act them, one of them alleging in ex-
evil predictions of the manager. Goldsmith was advised to postpone the performance of his play until he could get their important parts well supplied. "No," said he, "I would sooner that my play were damned by bad players than merely saved by good acting."

The friends of Goldsmith, who had stood up for the merit of his play, and being irritated and disgusted by the treatment it had received from the manager, determined to muster their forces, and aid in giving it a good launch upon the town. The particulars of this confederation, and of its triumphant success, are amusingly told by Cumberland in his memoirs.

"We were not over-sanguine of success, but perfectly determined to struggle hard for our author. We accordingly assembled our strength at the Shakspeare Tavern, in a considerable body, for an early dinner, where Samuel Johnson took the chair at the head of a long table, and was the life and soul of the corps: the poet took post silently by his side, with the Burkes, Sir Joshua Reynolds, Fitzherbert, Caleb Whitefoord, and a phalanx of North British, predetermined applauders, under the banner of Major Mills, all good men and true. Our illustrious president was in inimitable glee; and poor Goldsmith that day took all his raillery as patiently and complacently as my friend Boswell would have done any day, or every day of his life. In the meantime, we did not forget our duty; and though we had a better comedy going, in which Johnson was chief actor, we betook ourselves in good time to our separate and allotted posts, and waited the awful drawing up of the curtain. As our stations were preconcerted, so were our signals for plaudits arranged and determined upon in a manner that gave every one his cue where to look for them, and how to follow them up.

"We had among us a very worthy and efficient member, long since lost to his friends and the world at large, Adam Drummond, of amiable memory, who was gifted by nature with the most sonorous, and, at the same time, the most contagious laugh that ever echoed from the human lungs. The neighing of the horse of the son of Hystaspes was a whisper to it; the whole thunder of the theatre could not drown it. This kind and ingenious friend fairly forewarned us, that he knew no more when to give his fire than the cannon did that was planted on a battery. He desired, therefore, to have a flapper at his elbow, and I had the honour to be deputed to that office. I planted him in an upper box, pretty nearly over the stage, in full view of the pit and galleries, and perfectly well suited to give the echo all its play through the hollows and recesses of the theatre. The success of our manœuvre was complete. All eyes were upon Johnson, who sat in a front row of a side box; and, when he laughed, everybody thought themselves warranted to roar. In the meantime, my friend followed signals with a rattle so irresistibly comic, that, when he had repeated it several times, the attention of the spectators was so engrossed by his person and performances, that the progress of the play seemed likely to become a secondary object, and I found it prudent to insinuate to him that he might halt his music without any prejudice to the author; but, alas! it was now too late to rein him in: he had laughed upon my signal where he found no joke, and now, unluckily, he fancied that he found a joke in almost everything that was said; so that nothing in nature could be more mal-a-propos than some of his bursts every now and then were. These were dangerous moments, for the pit began to take umbrage; but we carried our point through, and triumphed not only over Colman's judgment, but our own."

While his friends were thus cheering his play triumphantly through its ordeal, poor Goldsmith was wandering up and down St. James's Park like a troubled spirit. At length he could not resist his anxiety to ascertain his fate, and ventured dubiously to the theatre. Just as he entered behind the scenes there was a slight hiss from the pit at a coarse sally of Tony Lumpkin. "What's that? what's that?" cried Goldsmith to the manager, in great agitation. "Pshaw, doctor," replied Colman, sarcastically, "don't be frightened at squibs, when we've been sitting these two hours upon a barrel of gunpowder." Though of a most forgiving nature, Goldsmith did not easily forget this ungenerous and ill-timed sally.

If Colman was indeed actuated by the paltry motives ascribed to him in his treatment of this play, he was most amply punished by its success, and by the taunts, epigrams, and censures levelled at him through the press: in which his false prophecies were jeered at; his critical judgment called in question; and he was openly taxed with literary jealousy. So galling and unremitting was the fire, that he at length wrote to Goldsmith, entreating him "to take him off the rack of the newspapers;" in the meantime, to escape the laugh that was raised about him in the theatrical world of London, he took refuge in Bath during the triumphant career of the comedy.

Neither did Goldsmith escape those sneers and jeers of the press usually levelled by the underlings of literature at successful authors; but he was amply indemnified by the award of all true critics. "I know of no comedy for many years," said Dr. Johnson, "that has so much exhilarated an audience; that has answered so much the great end of comedy—making an audience merry."

Goldsmith also gleaned applause from less authoritative sources. To Northcote, the painter, then a youthful pupil of Sir Joshua Reynolds, he had given some tickets, and inquired his opinion of the play. The other modestly declared he could not presume to judge in the matter. "Did it make you laugh?" asked Goldsmith. "Oh, exceedingly." "That's all that I require," said the poet.

The following anonymous attack, made upon Goldsmith on this occasion, was of so base and personal a nature as to rouse his indignation·

"FOR THE LONDON PACKET.

"*To Dr. Goldsmith.*

"*Vous vous noyez par vanite.*

"SIR, — The happy knack which you have learned of puffing your own compositions, provokes me to come forth. You have not been the editor of newspapers and magazines not to discover the trick of literary *humbug;* but the gauze is so thin that the very foolish part of the world see through it, and discover the doctor's monkey face and cloven foot. Your poetic vanity is as unpardonable as your personal. Would man believe it, and will woman bear it, to be told that for hours the great Goldsmith will stand surveying his grotesque orang-outang's figure in a pier-glass? Was but the lovely H——k as much enamoured, you would not sigh, my gentle swain, in vain. But your vanity is preposterous. How will this same bard of Bedlam ring the changes in the praise of Goldy! But what has he to be either proud or vain of? 'The Traveller' is a flimsy poem, built upon false principles—principles diametrically opposite to liberty. What is 'The Good-natured Man' but a poor, water-gruel, dramatic dose? What is 'The Deserted Village' but a pretty poem, of easy numbers, without fancy, dignity, genius, or fire? And, pray, what may be the last *speaking pantomime*, so praised by the doctor himself, but an incoherent piece of stuff, the figure of a woman with a fish's tail, without plot, incident or intrigue? We are made to laugh at stale, dull jokes, wherein we mistake pleasantry for wit, and grimace for humour; wherein every scene is unnatural, and inconsistent with the rules, the laws of nature and of the drama; viz., two gentlemen come to a man of fortune's house, eat, drink, &c., and take it for an inn. The one is intended as a lover for the daughter; he talks with her for some hours, and, when he sees her again in a different dress, he treats her as a bar-girl, and swears she squinted. He abuses the master of the house, and threatens to kick him out of his own doors. The squire, whom we are told is to be a fool, proves to be the most sensible being of the piece; and he makes out a whole act by bidding his mother lie close behind a bush, persuading her that his father, her own husband, is a highwayman, and that he has come to cut their throats; and, to give his cousin an opportunity to go off, he drives his mother over hedges, ditches, and through ponds. There is not, sweet, sucking Johnson, a natural stroke in the whole play but the young fellow's giving the stolen jewels to the mother, supposing her to be the landlady. That Mr. Colman did no justice to this piece, I honestly allow; that he told all his friends it would be damned, I positively aver; and, from such ungenerous insinuations, without a dramatic merit, it rose to public notice, and it is now the ton to go and see it, though I never saw a person that either liked it or approved it, any more than the absurd plot of Home's tragedy of 'Alonzo.' Mr. Goldsmith, correct your arrogance, reduce your vanity, and endeavour to believe, as a man, you are of the plainest sort; and as an author, but a mortal piece of mediocrity.

" Brise le miroir infidele
Qui vous cache le verite.

"TOM TICKLE."

Goldsmith might have suffered those parts of the letter to pass unheeded which related merely to himself and his authorship; but the allusion to the lovely H——k, and to his being an unsuccessful admirer, appears to have stung him to the quick. We presume the lady in question was one of his beautiful fellow-travellers, the Miss Hornecks, and it is possible the sly innuendo may not have been entirely unfounded. The paragraph in question was first pointed out to him by an officious friend, an Irishman, who very sagely told him he was in honour bound to resent it. Goldsmith took fire in an instant, and, accompanied by his sagacious adviser, called upon Evans, the publisher, in Paternoster Row. Entering the shop and announcing himself, "I have called," said he, "in consequence of a scurrilous attack upon me, and an unwarrantable liberty taken with the name of a young lady. As for myself, I care little; but her name must not be sported with."

Evans, who was merely the proprietor of the paper, professed utter ignorance of the matter, and said he would speak to the editor. He stooped to examine a file of the paper in search of the offensive article, whereupon Goldsmith's friend gave him a signal that now was a favourable moment for the exercise of his cane. The hint was taken as quick as given, and the cane of the author was vigorously applied to the back of the stooping publisher. The latter rallied in an instant, and, being a stout, high-blooded Welshman, returned the blows with interest. A lamp hanging over-head was broken, and sent down a shower of oil upon the combatants, but the battle waged with unceasing fury. A shopman ran off for a constable, and Goldsmith's gunpowder friend, seeing matters growing serious, abandoned him to his fate, and fled the battle-ground. The author was nearly overpowered by the stout Welshman, when Dr. Kenrick, who happened to be in an adjacent room, sallied forth, interfered between the combatants, and put an end to the affray. Goldsmith was conducted to a coach in exceedingly tattered plight, and Kenrick accompanied him home, soothing him with much mock commiseration, though he was generally suspected to be the author of the libel.

Evans immediately instituted a suit against Goldsmith for an assault, but was ultimately prevailed upon to compromise the matter, the poet contributing fifty pounds to the Welsh charity.

The newspapers made themselves, as may well be supposed, exceedingly merry with the combat. Some censured him severely for invading the sanctity of a man's own house; others accused him of having, in his former capacity of editor of a magazine, been guilty of the very offences that he now resented in others. This drew from him the following vindication:

"*To the Public.*

"Lest it should be supposed that I have been willing to correct in others an abuse of which I have been guilty myself, I beg leave to declare, that, in all my life, I never wrote or dictated a single paragraph, letter, or essay in a newspaper, except a few moral essays under the character of a Chinese, about ten years ago, in the Ledger, and a letter, to which I signed my name, in the St. James's Chronicle. If the liberty of the press, therefore, has been abused, I have had no hand in it.

"I have always considered the press as the protector of our freedom, as a watchful guardian, capable of uniting the weak against the encroachments of power. What concerns the public most properly admits of a public discussion. But, of late, the press has turned from defending public interest to making inroads upon private life; from combating the strong to overwhelming the feeble. No condition is now too obscure for its abuse, and the protector has become the tyrant of the people. In this manner the freedom of the press is beginning to sow the seeds of its own dissolution; the great must oppose it from principle, and the weak from fear; till at last every rank of mankind shall be found to give up its benefits, content with security from insults.

"How to put a stop to this licentiousness, by which all are indiscriminately abused, and by which vice consequently escapes in the general censure, I am unable to tell; all I could wish is, that, as the law gives us no protection against the injury, so it should give calumniators no shelter after having provoked correction. The insults which we receive before the public, by being more open, are the more distressing; by treating them with silent contempt we do not pay a sufficient deference to the opinion of the world. By recurring to legal redress we too often expose the weakness of the law, which only serves to increase our mortification by failing to relieve us. In short, every man should singly consider himself as the guardian of the liberty of the press, and, as far as his influence can extend, should endeavour to prevent its licentiousness becoming at last the grave of its freedom.

"OLIVER GOLDSMITH."

This vindication, it was affirmed, had been written for the poet by Dr. Johnson, and Boswell intimated to the latter his suspicions that such was the fact. "Sir," replied Johnson, "Goldsmith would no more have asked me to have wrote such a thing as that for him, than he would have asked me to feed him with a spoon, or do anything else that denoted his imbecility. I as much believe that he wrote it as if I had seen him do it. Sir, had he shown it to any one friend, he would not have been allowed to publish it. He has, indeed, done it very well, but it is a foolish thing well done. I suppose he has been so much elated with the success of his new comedy, that he has thought everything that concerned him must be of importance to the public."

An amusing anecdote is given, we believe, with respect to the success of this play, as illustrative of that mingled vanity and simplicity for which Goldsmith was noted. At a dinner-party at which he was present, something was said about the king's coming to see his new play. "I wish he would," said Goldsmith; but immediately added, with an air of affected indifference, "Not that it would do me the least good." "Well, then, sir," said Dr. Johnson, "let us say it would do him good (laughing). No, sir, this affectation will not pass: it is mighty idle. In such a state as ours, who would not wish to please the chief magistrate?" "I do wish to please," replied Goldsmith. "I remember a line in Dryden,

'And every poet is the monarch's friend.'

It ought to be reversed." Johnson.—"Nay, sir, there are finer lines in Dryden on this subject.

'For colleges on bounteous kings depend,
And never rebel was to arts a friend.'"

The profits of Goldsmith on the performance and publication of 'She Stoops to Conquer,' amounted to upwards of eight hundred pounds. They were soon absorbed, however, by his heedless expenses, his open-handed and profuse charities, his gaming propensities, and his accumulating debts. Indeed, he was generally in advance of his pen, and had received from the booksellers the price of his works before they were completed. An amount of debt for moneys borrowed from booksellers, and for purchases of various kinds, was going on increasing unknown to his friends, who had no idea of his embarrassments, and of the anxiety of mind that kept him tasking his pen, while it impaired that ease and freedom of spirit necessary to felicitous composition.

In 1773 he made a desperate effort to relieve himself from debt by a variety of labour. His regular and constant task of 'Animated Nature' was still going on; but, unluckily, he had already received more than the amount of remuneration from the booksellers. He now projected a work of still greater compass, which would probably give him employment and income for several years. This was a 'Dictionary of Arts and Sciences.' He had already received promises of assistance from several powerful hands. Johnson was to contribute an article on Ethics; Burke an abstract of his Essay on the Sublime and Beautiful, an essay on the Berkleyan system of Philosophy, and others on Political Science; Sir Joshua Reynolds an Essay on Painting, Dr. Burney on Music, and Garrick on Acting. Other writers of eminence were to be sought for the various departments of science, while Goldsmith was to edit the whole, and intended to diffuse over it the graces of his style. He drew up a prospectus of his plan, which is said to have been written with uncommon ability, and to have had all that perspicuity and elegance for which his writings were remarkable. Unfortunately, the booksellers, intimidated by the amount of capital required and the length of time that must expire before the work could be prepared for publication, shrunk from engaging in the undertaking, distrusting, perhaps, his steadfast application, and doubting his capacity for a work which required extent and accuracy of knowledge rather than fertility of genius.

The failure of this project, on which he had built such spacious hopes, sank deep in the heart of Goldsmith; he was still farther grieved and mortified by the fruitless result of an effort made by some of his friends to secure him a provision from government; with flagging spirits, therefore, he returned to his irksome toil of "book-building;" and we find him, in the course of the year, besides his 'Animated Nature,' writing a History of Greece on a similar plan to his History of Rome; a History of England (the third one from his pen), in one volume octavo, for the use of schools; a translation of the comic romance of Scarron; and a Survey of Experimental Philosophy. His health, however, was impaired by this sedentary application and mental drudgery; his spirits were depressed by pecuniary care; he lost his usual gayety and good-nature, and became, at times, peevish and irritable. Too proud of spirit to seek sympathy or relief from his friends from the pecuniary difficulties which he had brought upon himself by his want of the saving art, he buried his cares and anxieties in his own bosom, and endeavoured in company to keep up his usual air of gayety and unconcern. This gave his conduct an appearance of fitfulness and caprice, varying suddenly from moodiness to mirth, and silent gravity to shallow laughter, that caused surprise and ridicule in those who were not aware of the sickness of heart that lay beneath.

It was during this fitful state of mind that he penned the 'Retaliation.' A number of his intimate associates, as well members of the Literary Club as others, were assembled to dine together at the St. James' Coffee-house. Goldsmith, as usual, came last, and in a bustle. The whim seized the company to write epitaphs upon him as "the late Dr. Goldsmith," and several were thrown off in a playful vein, hitting off his harmless peculiarities, which were often subjects of good-natured banter among his friends. The only one extant was written by Garrick, and has been preserved, very probably by its pungency, which was not altogether relished by the poet:

> "Here lies poet Goldsmith, for shortness called Noll,
> Who wrote like an angel, but talk'd like poor Poll."

Goldsmith was not a man for ready repartee, but he took his time, and in the interval of his various tasks concocted a series of epigrammatic sketches, under the title of Retaliation, in which the characters of his distinguished intimates were admirably hit off, with a mixture of generous praise and good-humoured raillery. When he came to the portrait of David Garrick, he had some lurking piques to gratify. Garrick had refused his plays: he had often indulged his wit in company at his expense: he had been capricious in his conduct, sometimes treating him with gross familiarity, at other times assuming airs of superiority, and affecting dignity and reserve; lastly, he had been guilty of the couplet just quoted. Goldsmith therefore touched off the lights and shadows of his character with a free hand, and, at the same time, gave a side-hit at his old rival Kelly, and his critical persecutor Kenrick, in making them sycophantic satellites of the actor. Goldsmith, however, was void of gall even in his revenge, and his very satire was more humorous than caustic.

> "Here lies David Garrick, describe him who can,
> An abridgment of all that was pleasant in man;
> As an actor, confess'd without rival to shine;
> As a wit, if not first, in the very first line:
> Yet, with talents like these, and an excellent heart,
> The man had his failings, a dupe to his art.
> Like an ill-judging beauty, his colours he spread,
> And beplaster'd with rouge his own natural red.
> On the stage he was natural, simple, affecting;
> 'Twas only that when he was off he was acting.
> With no reason on earth to go out of his way,
> He turn'd and he varied full ten times a-day:
> Though secure of our hearts, yet confoundedly sick
> If they were not his own by finessing and trick:
> He cast off his friends as a huntsman his pack,
> For he knew, when he pleased, he could whistle them back.
> Of praise a mere glutton, he swallow'd what came,
> And the puff of a dunce he mistook it for fame;
> Till his relish, grown callous almost to disease,
> Who pepper'd the highest was surest to please.
> But let us be candid, and speak out our mind,
> If dunces applauded, he paid them in kind.
> Ye Kenricks, ye Kellys, and Woodfalls so grave,
> What a commerce was yours, while you got and you gave!
> How did Grub-street re-echo the shouts that you raised,
> While he was be-Rosciused and you were be-praised!
> But peace to his spirit, wherever it flies,
> To act as an angel and mix with the skies:
> Those poets who owe their best fame to his skill,
> Shall still be his flatterers, go where he will;
> Old Shakspeare receive him with praise and with love,
> And Beaumonts and Bens be his Kellys above."

This portion of Retaliation soon brought a retort from Garrick, which we insert as giving something of a likeness of Goldsmith, though in broad caricature.

> "Here, Hermes, says Jove, who with nectar was mellow,
> Go fetch me some clay—I will make an odd fellow:
> Right and wrong shall be jumbled, much gold and some dross,
> Without cause be he pleased, without cause be he cross;
> Be sure, as I work, to throw in contradictions,
> A great love of truth, yet a mind turn'd to fictions;
> Now mix these ingredients, which, warm'd in the baking,
> Turn'd to *learning* and *gaming, religion* and *raking*.
> With the love of a wench let his writings be chaste;
> Tip his tongue with strange matter, his lips with fine taste
> That the rake and the poet o'er all may prevail,
> Set fire to the head and set fire to the tail;
> For the joy of each sex on the world I'll bestow it,
> This scholar, rake, Christian, dupe, gamester, and poet.
> Though a mixture so odd, he shall merit great fame,
> And among brother mortals be Goldsmith his name;
> When on earth this strange meteor no more shall appear,
> You, *Hermes*, shall fetch him, to make us sport here."

These are the last reliques we have of poor Goldsmith and his literary career. In the early part of 1774 he made an effort to rally his spirits by going into gay society: a mode of dissipating care which he commended in his essays. "Our club," writes Beauclerk about this time, "has dwindled away to nothing. Nobody attends but Mr. Chambers, and he is going to the East Indies. Sir Joshua and Goldsmith have got into such a round of pleasures that they have no time."

In this forced mood he gave entertainments in his chambers in the Temple, and at an expense far beyond his means. The last of these was a dinner to Johnson, Reynolds, and others of his intimates, who partook with sorrow and reluctance of his imprudent hospitality. The first course vexed them by its needless profusion. When a second, equally extravagant, was served up, Johnson and Reynolds declined to partake of it; the rest of the company, understanding their motives, followed their example, and the dishes went from the table untasted; Goldsmith felt sensibly this silent and well-intended rebuke.

The gayeties of society, however, cannot medicine for any length of time a mind diseased. Wearied of the distractions and harassed by the expenses of a town life, Goldsmith now thought of retiring to the serene quiet and cheap pleasures of the country, and of only passing two months of the year in London. He accordingly sold his right in the Temple Chambers, and, in the month of March, retired to his country quarters at Hyde; but the recurrence of a painful disease, which had been gradually increasing upon him for some years past, added to the general decline of his health, soon brought him back to London. The local complaint subsided, but was succeeded by a nervous fever. Mental anxieties and disappointments, which had previously sapped his constitution, doubtless aggravated his present complaint; for, in reply to the inquiries of his physician, he acknowledged that his mind was not at ease. His malady fluctuated for several days, and hopes were entertained of his recovery, but they proved fallacious. He expired on the 4th of April, 1774, in the forty-fifth year of his age. That his premature death was hastened by mental distress, was the universal opinion of his friends, especially when they found out the embarrassed state of his affairs. "Of poor Dr. Goldsmith," said Johnson to Boswell, "there is little to be told more than the papers have made public. He died of a fever, made, I am afraid, more violent by uneasiness of mind. His debts began to be heavy, and all his resources were exhausted. Sir Joshua is of opinion that he owed no less than two thousand pounds. Was ever poet so trusted before?"*

The death of Goldsmith was a shock to the literary world, and a deep affliction to a wide circle of intimates and friends; for, with all his foibles and peculiarities, he was fully as much beloved as he was admired. Burke, on hearing the news, burst into tears, and Sir Joshua Reynolds threw by his pencil for the day and grieved. In the warm feeling of the moment, it was determined to honour his remains by a public funeral and a tomb in Westminster Abbey. His very pall-bearers were designated, viz., Lord Shelburne, Lord Lowth, Sir Joshua Reynolds, the Hon. Mr. Beauclerk, Mr. Edward Burke, and David Garrick. This feeling cooled down, however, when it was discovered that he had died in debt, and had not left wherewithal to pay for such expensive obsequies. He was privately interred, therefore, on Saturday evening, in the Temple burying-ground, a few persons attending as mourners, among whom we do not find specified any of his peculiar and distinguished friends. One person, however, from whom it was but little to be expected, evinced real sorrow on the occasion. This was Hugh Kelly, once his dramatic opponent, and often, it was said, his anonymous assailant in the newspapers. If he had really been guilty of this basest of literary offences, he was punished by the stings of remorse, for we are told that he shed bitter tears over the grave of the man he had injured. His tardy atonement only provoked the lash of some unknown satirist, as the following lines will show:

"Hence Kelly, who years, without honour or shame,
Had been sticking his bodkin in Oliver's fame,
Who thought like the Tartar, by this to inherit
His genius, his learning, simplicity, spirit;
Now sets every feature to weep o'er his fate,
And acts as a mourner to blubber in state."

One base wretch deserves to be mentioned, the reptile Kenrick, who, after having repeatedly slandered Goldsmith while living, had the audacity to insult his memory when dead. The following distich is sufficient to show his malignancy, and to hold him up to execration:

"By his own art who justly died,
A blund'ring artless suicide:
Share, earthworms, share, since now he's dead,
His megrim, maggot-bitten head."

This scurrilous epitaph produced a burst of public indignation, and awed for a time even the infamous Kenrick into silence. On the other hand, the press teemed with tributes in verse and prose to the memory of the deceased; all evincing the mingled feeling of admiration for the author and affection for the man. The following eulogy, by Mr. Woty, will serve as a specimen:

"Adieu, sweet bard! to each fine feeling true,
Thy virtues many and thy foibles few;
Those forced to charm e'en vicious minds, and these
With harmless mirth the social soul to please.
Another's wo thy heart could always melt,
None gave more free, for none more deeply felt.
Sweet bard, adieu! thy own harmonious lays
Have sculptured out thy monument of praise;
Yes, these survive to Time's remotest day,
While drops the bust, and boastful tombs decay.
Reader, if number'd in the Muses' train,
Go, tune thy lyre, and imitate the strain;
But if no poet, then reverse the plan,
Depart in peace, and imitate the man."

Not long after the death of Goldsmith, the Literary Club set on foot a subscription, and raised a fund to erect a monument to his memory in Westminster Abbey. It was executed by Nollekins, and consisted simply of the bust of Goldsmith in profile, in high relief in a medallion, with a white marble tablet beneath, bearing the following inscription, composed by Dr. Johnson:

OLIVARII GOLDSMITH,
Poetæ, Physici, Historici,
Qui nullum ferè scribendi genus
Non tetigit,
Nullum quod tetigit non ornavit·
Sive Risus essent movendi,
Sive Lacrymæ,
Affectuum potens at lenis Dominator:
Ingenio sublimis, vividus, versatilis;
Oratione grandis. nitidus, venustus:
Hoc Monumento Memoriam coluit.
Sodalium Amor,
Amicorum Fides,
Lectorum Veneratio.
Natus in Hiberniâ Forniæ Longfordiensis,
In loco cui nomen Pallas,
Nov. XXIX., MDCCXXXI.;
Eblanæ Literis institutus;
Obiit Londini,
April. IV., MDCCLXXIV.*

We shall not pretend to follow these notices of the life of Goldsmith with any critical dissertan his writings; their merits have long since fully discussed, and their station in the scale erary merit permanently established. They outlasted generations of works of higher r and wider scope, and will continue to out- succeeding generations, for they have that charm of style which embalms works to tuity. Neither shall we indulge in extend- mments upon the character of the poet, is sufficiently illustrated in the preceding , but shall conclude with a few brief re- used by us on a former occasion. From eneral turn of Goldsmith's biography, it is nt that his faults, at the worst, were but ive, while his merits were great and decided. He was no one's enemy but his own; his errors, in the main, inflicted evil on none but himself, and were so blended with humorous, and even affecting circumstances, as to disarm anger and conciliate kindness. Where eminent talent is united to spotless virtue, we are awed and dazzled into admiration, but our admiration is apt to be cold and reverential; while there is something in the harmless infirmities of a good and great, but erring individual, that pleads touchingly to our nature; and the heart yearns more kindly towards the object of our idolatry, when we find that, like ourselves, he is mortal and is frail. The epithet so often heard, and in such kindly tones, of "poor Goldsmith," speaks volumes. Few, who consider the real compound of admirable and whimsical qualities which form his character, would wish to prune away its eccentricities, trim its grotesque luxuriance, and clip it down to the decent formalities of rigid virtue. "Let not his frailties be remembered," said Johnson; "he was a very great man." But, for our part, we rather say, "let them be remembered," for we question whether he himself would not feel gratified in hearing his reader, after dwelling with admiration on the proofs of his greatness, close the volume with the kind-hearted phrase, so fondly and familiarly ejaculated, of "POOR GOLDSMITH!"

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* His debts actually amounted to £4,000.

*The following translation to the above is from Prior's life of Goldsmith:

This Monument is raised
to
OLIVER GOLDSMITH,
Poet, Natural Philosopher, Historian,
Who left no species of writing untouched
or
Unadorned by his pen,
Whether to move laughter
or draw tears.
He was a powerful, yet gentle
master over the affections:

f a genius sublime, lively, and versatile,
In expression noble, pure, and elegant.
His memory will last
While Society retains affection,
Friendship is not void of truth,
And Reading is held in high esteem.
He was born in Ireland,
the parish of Forney, County of Longford,
At a place named Pallas,
29th November, 1731;
He was educated in Dublin,
And died in London,
4th April, 1774.

A HISTORY OF
THE EARTH AND ANIMATED NATURE.

PART FIRST.
HISTORY OF THE EARTH.

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PREFACE TO THE ORIGINAL EDITION.

Natural History, considered in its utmost extent, comprehends two objects. First, that of discovering, ascertaining, and naming, all the various productions of Nature. Secondly, that of describing the properties, manners, and relations, which they bear to us, and to each other. The first, which is the most difficult part of this science, is systematical, dry, mechanical, and incomplete The second is more amusing, exhibits new pictures to the imagination, and improves our relish for existence, by widening the prospect of nature around us.

Both, however, are necessary to those who would understand this pleasing science in its utmost extent. The first care of every inquirer, no doubt, should be, to see, to visit, and examine, every object, before he pretends to inspect its habitudes or its history. From seeing and observing the thing itself, he is most naturally led to speculate upon its uses, its delights, or its inconveniences.

Numberless obstructions, however, are found in this part of his pursuit that frustrate his diligence and retard his curiosity. The objects in nature are so many, and even those of the same kind are exhibited in such a variety of forms, that the inquirer finds himself lost in the exuberance before him, and, like a man who attempts to count the stars, unassisted by art, his powers are all distracted in the barren superfluity.

To remedy this embarrassment, artificial systems have been devised, which, grouping into masses those parts of nature more nearly resembling each other, refer the inquirer for the name of the single object he desires to know, to some one of those general distributions, where it is to be found by farther examination.

If, for instance, a man should, in his walks, meet with an animal, the name, and consequently the history, of which he desires to know, he is taught by systematic writers of natural history to examine its most obvious qualities, whether a quadruped, a bird, a fish, or an insect. Having determined it, for explanation's sake, to be an insect, he examines whether it has wings; if he finds it possessed of these, he is taught to examine whether it has two or four; if possessed of four, he is taught to observe, whether the two upper wings are of a shelly hardness, and serve as cases to those under them; if he finds the wings composed in this manner, he is then taught to pronounce that this insect is one of the beetle kind: of the beetle kind there are three different classes, distinguished from each other by their feelers; he examines the insect before him, and finds that the feelers are clavated or knobbed at the ends; of beetles, with feelers thus formed, there are ten kinds; and among those he is taught to look for the precise name of that which is before him. If, for instance, the knob be divided at the ends, and the belly be streaked with white, it is no other than the Dorr, or the May-bug; an animal, the noxious qualities of which give it a very distinguished rank in the history of the insect creation. In this manner a system of natural history may, in some measure, be compared to a dictionary of words. Both are solely intended to explain the names of things; but with this difference, that in the dictionary of words we are led from the name of the thing to its definition; whereas in the system of natural history, we are led from the definition to find out the name.

Such are the efforts of writers, who have composed their works with great labour and ingenuity, to direct the learner in his progress through nature, and to inform him of the name of every animal, plant, or fossil substance, that he happens to meet with: but it would be only deceiving the reader to conceal the truth, which is, that books alone can never teach him this art in perfection: and the solitary student can never succeed. Without a master, and a previous knowledge of many of the objects of nature, his book will only serve to confound and disgust him. Few of the individual plants or animals, that he may happen to meet with, are in that precise state of health, or that exact period of vegetation, from whence their descriptions were taken. Perhaps he meets the plant only with leaves, but the systematic writer has described it in flower. Perhaps he meets the bird before it has moulted its first feathers, while the systematic description was made in its state of full perfection. He thus ranges without an instructor, confused, and with sickening curiosity, from subject to subject, till at last he gives up the pursuit, in the multiplicity of his disappointments.

Some practice, therefore, much instruction, and diligent reading, are requisite to make a ready and expert naturalist, who shall be able, even by the help of a system, to find out the name of every object he meets with. But when this tedious, though requisite, part of study is attained, nothing but delight and variety attend the rest of his journey. Wherever he travels, like a man in a country where he has many friends, he meets with nothing but acquaintances and allurements in all the stages of his way. The mere uninformed spectator passes on in gloomy solitude; but the naturalist, in every plant, in every insect, and every pebble, finds something to entertain his curiosity, and excite his speculation.

From hence it appears, that a system may be considered as a dictionary in the study of nature. The ancients, however, who have written most delightfully on this subject, seem entirely to have rejected those humble and mechanical helps to science. They contented themselves with seizing upon the great outlines of history, and passing over what was common, as not worth the detail; they only dwelt upon what was new, great, and surprising, and sometimes even warmed the imagination at the expense of truth. Such of the moderns as revived this science in Europe, undertook the task more methodically, though not in a manner so pleasing. Aldrovandus, Gesner, and Johnson, seemed desirous of uniting the entertaining and rich descriptions of the ancients with the dry and systematic arrangement, of which they were the first projectors. This attempt, however, was extremely imperfect, as the great variety of nature was, as yet, but very inadequately known. Nevertheless, by attempting to carry on both objects at once, first of directing us to the name of the thing, and then giving the detail of its history, they drew out their works into a tedious and unreasonable length; and thus mixing incompatible aims, they have left their labours rather to be occasionally consulted, than read with delight, by posterity.

The later moderns, with that good sense which they have carried into every other part of science, have taken a different method in cultivating natural history. They have been content to give, not only the brevity, but also the dry and disgusting air of a dictionary, to their systems. Ray, Klein, Brisson, and Linnæus, have had only one aim, that of pointing out the object in nature, of discovering its name, and where it was to be found in those authors that treated of it in a more prolix and satisfactory manner. Thus natural history, at present, is carried on in two distinct and separate channels, the one serving to lead us to the thing, the other conveying the history of the thing, as supposing it already known.

The following Natural History is written with only such an attention to system as serves to remove the reader's embarrassments, and allure him to proceed. It can make no pretensions in directing him to the name of every object he meets with; that belongs to works of a very different kind, and written with very different aims. It will fully answer my design, if the reader, being already possessed of the name of any animal, shall find here a short, though satisfactory, history of its habitudes, its subsistence, its manners, its friendships, and hostilities. My aim has been to carry on just as much method as was sufficient to shorten my descriptions by generalizing them, and never to follow order where the art of writing, which is but another name for good sense, informed me that it would only contribute to the reader's embarrassment.

Still, however, the reader will perceive that I have formed a kind of system in the history of every part of animated Nature, directing myself by the great obvious distinctions that she herself seems to have made; which, though too few to point exactly to the name, are yet sufficient to illuminate the subject, and remove the reader's perplexity. Mr. Buffon, indeed, who has brought greater talents to this part of learning than any other man, has almost entirely rejected method in classing quadrupeds. This, with great deference to such a character, appears to me running into the opposite extreme; and as some moderns have of late spent much time, great pains, and some learning, all to very little purpose, in systematic arrangement, he seems so much disgusted by their trifling but ostentatious efforts, that he describes his animals almost in the order they happen to come before him. This want of method seems to be a fault; but he can lose little by a criticism which every dull man can make, or by an error in arrangement, from which the dullest are the most usually free.

In other respects, as far as this able philosopher has gone, I have taken him for my guide. The warmth of his style, and the brilliancy of his imagination, are inimitable. Leaving him, therefore, without a rival in these, and only availing myself of his information, I have been content to describe things in my own way; and though many of the materials are taken from him, yet I have added, retrenched, and altered, as I thought proper. It was my intention at one time, whenever I differed from him, to have mentioned it at the bottom of the page; but this occurred so often, that I soon found it would look like envy, and might perhaps convict me of those very errors which I was wanting to lay upon him. I have, therefore, as being every way his debtor, concealed my dissent, where my opinion was different; but wherever I borrow from him, I take care at the bottom of the page to express my obligations. But though my obligations to this writer are many, they extend to but the smallest part of the work, as he has hitherto completed only the history of quadrupeds. I was, therefore, left to my own reading alone, to

e out the history of birds, fishes, and insects,
hich the arrangement was so difficult, and
necessary information so widely diffused,
so obscurely related when found, that it
ed by much the most laborious part of the
ertaking. Thus having made use of Mr.
fon's lights in the first part of the work, I may
some share of confidence recommend it to
public. But what shall I say to that part,
re I have been entirely left without his as-
nce? As I would affect neither modesty nor
fidence, it will be sufficient to say, that my
ling upon this part of the subject has been
extensive; and that I have taxed my scanty
umstances in procuring books, which are on
subject, of all others, the most expensive.

consequence of this industry, I here offer a
k to the public, of a kind which has never
attempted in ours, or any other modern lan-
ge, that I know of. The ancients, indeed, and
y in particular, have anticipated me in the
ent manner of treating natural history. Like
e historians who describe the events of a
paign, they have not condescended to give
private particulars of every individual that
ed the army; they were content with char-
rizing the generals, and describing their
rations, while they left it to meaner hands to
y the muster-roll. I have followed their
ner, rejecting the numerous fables which
adopted, and adding the improvements of
moderns, which are so numerous, that they
ally make up the bulk of natural history.

he delight which I found in reading Pliny,
inspired me with the idea of a work of this
ure. Having a taste rather classical than scientific, and having but little employed myself in turning over the dry labours of modern system-makers, my earliest intention was to translate this agreeable writer, and by the help of a commentary to make my work as amusing as I could. Let us dignify natural history never so much with the grave appellation of *a useful science*, yet still we must confess, that it is the occupation of the idle and the speculative, more than of the busy and the ambitious part of mankind. My intention, therefore, was to treat what I then conceived an idle subject in an idle manner; and not to hedge round plain and simple narratives with hard words, accumulated distinctions, ostentatious learning, and disquisitions that produced no conviction. Upon the appearance, however, of Mr. Buffon's work, I dropped my former plan, and adopted the present, being convinced, by his manner, that the best imitation of the ancients was to write from our own feelings, and to imitate nature.

It will be my chief pride, therefore, if this work may be found an innocent amusement for those who have nothing else to employ them, or who require a relaxation from labour. Professed naturalists will, no doubt, find it superficial; and yet I should hope that even these will discover hints and remarks, gleaned from various reading, not wholly trite or elementary. I would wish for their approbation. But my chief ambition is to drag up the obscure and gloomy learning of the cell to open inspection, to strip it from its garb of austerity, and to show the beauties of that form, which only the industrious and the inquisitive have been hitherto permitted to approach.

HISTORY OF THE EARTH.

CHAP. I.

A SKETCH OF THE UNIVERSE.

E world may be considered as one vast man-
n, where man has been admitted to enjoy, to
mire, and to be grateful. The first desires of
age nature are merely to gratify the impor-
nities of sensual appetite, and to neglect the
templation of things, barely satisfied with
eir enjoyment: the beauties of nature, and all
wonders of creation, have but little charms
a being taken up in obviating the wants of
day, and anxious for precarious subsistence.

Philosophers, therefore, who have testified such
prise at the want of curiosity in the ignorant,
m not to consider that they are usually em-
yed in making provisions of a more important
ture; in providing rather for the necessities than the amusements of life. It is not till our more pressing wants are sufficiently supplied, that we can attend to the calls of curiosity; so that in every age scientific refinement has been the latest effort of human industry.

But human curiosity, though at first slowly excited, being at last possessed of leisure for indulging its propensity, becomes one of the greatest amusements of life, and gives higher satisfactions than what even the senses can afford. A man of this disposition turns all nature into a magnificent theatre, replete with objects of wonder and surprise, and fitted up chiefly for his happiness and entertainment: he industriously examines all things, from the minutest insect to the most finished animal; and, when his limited organs can no longer make the disquisition, he sends out his imagination upon new inquiries.

Nothing, therefore, can be more august and striking than the idea which his reason, aided by his imagination, furnishes of the universe around him. Astronomers tell us, that this earth which we inhabit, forms but a very minute part in that great assemblage of bodies of which the world[1] is composed. It is a million of times less than the sun, by which it is enlightened. The planets also, which, like it, are subordinate to the sun's influence, exceed the earth a thousand times in magnitude.[2] These, which were at first supposed to wander in the heavens without any fixed path, and that took their name from their apparent deviations, have long been found to perform their circuits with great exactness and strict regularity. They have been discovered as forming, with our earth, a system of bodies circulating round the sun, all obedient to one law, and impelled by one common influence.

Modern philosophy has taught us to believe, that, when the great Author of nature began the work of creation, he chose to operate by second causes; and that, suspending the constant exertion of his power, he endued matter with a quality, by which the universal economy of nature might be continued without his immediate assistance. This quality is called *attraction;* a sort of approximating influence, which all bodies, whether terrestrial or celestial, are found to possess; and which in all increases as the quantity of matter in each increases.[3] The sun, by far the greatest body in our system, is, of consequence, possessed of much the greatest share of this attracting power; and all the planets, of which our earth is one, are, of course, entirely subject to its superior influence. Were this power, therefore, left uncontrolled by any other, the sun must quickly have attracted all the bodies of our celestial system to itself; but it is equably counteracted by another power of equal efficacy; namely, a progressive force, which each planet received when it was impelled forward by the divine Architect, upon its first formation. The heavenly bodies of our system being thus acted upon by two opposing powers; namely, by that of *attraction*, which draws them towards the sun; and that of *impulsion*, which drives them straight forward into the great void of space; they pursue a track between these contrary directions; and each, like a stone whirled about in a sling, obeying two opposite forces, circulates round its great centre of heat and motion.

In this manner, therefore, is the harmony of our planetary system preserved. The sun, in the midst, gives heat, and light, and circular motion, to the planets which surround it: Mercury, Venus, the Earth, Mars, Jupiter, and Saturn, perform their constant circuits at different distances, each taking up a time to complete its revolutions proportioned to the greatness of the circle which it is to describe.[4] The lesser planets also, which are attendants upon some of the greater, are subject to the same laws; they circulate with the same exactness; and are, in the same manner, influenced by their respective centres of motion.

Besides those bodies which make a part of our peculiar system, and which may be said to reside within its great circumference, there are others that frequently come among us, from the most distant tracts of space, and that seem like dangerous intruders upon the beautiful simplicity of nature. These are comets, whose appearance was once so terrible to mankind; and the theory of which is better understood at present: we know that their number is much greater than that of the planets; and that, like these, they roll in orbits, in some measure obedient to solar influence. Astronomers have endeavoured to calculate the returning periods of many of them; but experience has not, as yet, confirmed the veracity of their investigations. Indeed, who can tell, when those wanderers have made their excursions into other worlds and distant systems, what obstacles may be found to oppose their progress, to accelerate their motions, or retard their return?[5]

But what we have hitherto attempted to sketch is but a small part of that great fabric in which the Deity has thought proper to manifest his wisdom and omnipotence. There are multitudes of other bodies, dispersed over the face of the heavens, that lie too remote for examination: these have no motion, such as the planets are found to possess, and are, therefore, called *fixed stars;* and from their extreme brilliancy, and their immense distance, philosophers have been induced to suppose them to be suns, resembling that which enlivens our system. As the imagination also, once excited, is seldom contented to stop, it has furnished each with an attendant system of planets belonging to itself; and has even induced some to deplore the fate of those systems, whose imagined suns, which sometimes happens, have become no longer visible.[6]

But conjectures of this kind, which no reasoning can ascertain, nor experiment reach, are rather amusing than useful. Though we see the greatness and wisdom of the Deity in all the seeming worlds that surround us, it is our chief concern to trace him in that which we inhabit. The examination of the earth, the wonders of its contrivance, the history of its advantages, or of the seeming defects in its formation, are the proper business of the *natural historian.* A description of this *earth*, its *animals*, *vegetables*, and *minerals*, is the most delightful entertainment the mind can be furnished with, as it is the most interesting and useful. I would beg leave, therefore, to conclude these common-place speculations, with an observation which, I hope, is not entirely so.

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[1] Goldsmith uses the term *world* here as synonymous with *universe*.—ED.

[2] These comparative admeasurements are here expressed in language which does not profess to be that of scientific accuracy, but suffices for the purpose of the author. The reader is referred to the Supplementary Notes at the end of the chapter for more accurate and precise statements on several points touched upon by Goldsmith.—ED.

[3] See Supplementary Note A, p. 61.

[4] See Supplementary Note B, p. 62.

[5] See Supplementary Note C, p. 63.

[6] See Supplementary Note D, p. 64.

A use, hitherto not much insisted upon, that may result from the contemplation of celestial magnificence, is, that it will teach us to make an allowance for the apparent irregularities we find below. Whenever we can examine the works of the Deity at a proper point of distance, so as to take in the whole of his design, we see nothing but uniformity, beauty, and precision. The heavens present us with a plan, which, though inexpressibly magnificent, is yet regular beyond the power of invention. Whenever, therefore, we find any apparent defects in the earth, which we are about to consider, instead of attempting to reason ourselves into an opinion that they are beautiful, it will be wiser to say, that we do not behold them at the proper point of distance, and that our eye is laid too close to the objects, to take in the regularity of their connexion. In short, we may conclude, that God, who is regular in his GREAT productions, acts with equal uniformity in the LITTLE.

NOTE A.—*Theory of Gravitation.*

Although we are indebted to Sir Isaac Newton for the complete discovery of the law of universal gravitation, and its application to the explanation of the planetary motions, yet, the existence of the law had been surmised by different philosophers, both of ancient and modern times. Copernicus, the celebrated restorer of the true system of astronomy, in speaking of the gravity of terrestrial bodies, by which they tend towards the centre of the earth, and to which the figure of the earth is owing, observes, that it is highly reasonable to suppose, that by a like principle, diffused from the sun and planets, their figures are preserved in their various motions; and Fermat, a mathematician of great eminence, who lived in the 15th century, appears to have had accurate notions, to a certain extent at least, of the nature of this law; for he says, that the weight of a body is the sum of the tendencies of each particle to every particle of the earth; and among the moderns he is the first that made this remark. The justly celebrated Kepler, however, extended his views still farther; for in his *Epitome Astronomiæ Copernicanæ*, he says, that if there be supposed two bodies placed out of the reach of all external forces, and at perfect liberty to move, they would approach each other with velocities inversely proportional to their quantities of matter; the moon, says he, and the earth mutually attract each other, and are prevented from meeting by their revolution round their common centre of attraction, and he says, that the tides of the ocean are the effects of the moon's attraction, heaping up the waters immediately under her. Then, adopting the opinion of Dr. Gilbert, that the earth is a great magnet, he explains how this mutual attraction will produce a deflection into a curvilineal path. Dr. Hooke appears to have had very accurate general notions of the nature of the mutual attraction of the celestial bodies; for, at a meeting of the Royal Society in the year 1666, he expressed himself as follows: "I will explain a system of the world very different from any yet received, and it is founded on the three following positions. 1. That all the heavenly bodies have not only a gravitation of their parts towards their own proper centre, but that they mutually attract each other within their spheres of action. 2. That all bodies having a simple motion, will continue to move in a straight line, unless continually deflected from it by some extraneous force, causing them to describe a circle, an ellipse, or some other curve. 3. That this attraction is so much the greater as the bodies are nearer. As to the proportion in which those forces diminish by an increase of distance, I own," said he, "I have not discovered it, although I have made some experiments to this purpose: I leave this to others, who have time and knowledge sufficient for this task." Previous to this period, Dr. Hooke had exhibited to the Society an experiment, with a view to show how a motion in a curve might be produced in consequence of a tendency in a body towards a centre. A ball suspended by a thread from the ceiling was made to revolve about another ball laid on a table immediately below the point of suspension. When the push given to the pendulous ball was properly adjusted to its deviation from the perpendicular, it described a perfect circle round the ball on the table, but when the push was very great, or very small, it described an ellipse, having the other ball in its centre. Dr. Hooke showed that this was the operation of a deflecting force directly proportional to the distance from the other ball; but he added, that although this illustrated the planetary motions in some degree, yet it was not suitable to their cause; for the planets describe ellipses, having the sun not in the centre, but in one of their foci; therefore they are not retained by force proportional to their distance from the sun. In these remarks, we have a clear and modest account of a rational theory; and it must be inferred from them, that Dr. Hooke had anticipated Newton in describing the general nature of the planetary motions, although it is solely to the latter that we owe the discovery of the precise law of the force by which the very motions we observe are produced.

To this extent the true theory of the motions of the heavenly bodies had been discovered, or rather conjectured, when Sir Isaac Newton turned his attention to the subject. The circumstances under which he discovered the true theory of the planetary motions, are stated by Dr. Pemberton, in his preface to this '*View of Sir Isaac Newton's Philosophy.*' They are in substance as follows: He had retired from Cambridge to his country house in the year 1666, on account of the plague; and one day as he sat alone in his garden, reflecting on the power by which all terrestrial bodies gravitate towards the earth, it occurred to him, that as this power is not sensibly diminished at any distance to which we can recede from the earth's centre, there seemed reason to conclude that it extended much farther than was commonly supposed, and even might extend as far as the moon; and if this were true, he concluded that her motion would be influenced by it, and that probably it was this very force which retained her in her orbit. However, although the force of gravity be not sensibly less at the tops of the highest mountains, than at the ordinary level of the earth's surface, he conceived it to be very possible, that at so great a distance as that of the moon, it might be considerably different. To make an estimate of what might be the degree of the diminution, he considered that if the moon be retained in her orbit by the force of gravity, no doubt the primary planets are carried round the sun by a like power; and by comparing the periods of the several planets with their distances from the sun, he found that if any power like gravity kept them in their orbits, its strength must decrease in proportion as the squares of the distances increase: but in making this conclusion he supposed that the orbits of the planets were circles, having the sun in their centre, from which figure the greater part of them do not much differ. Supposing, therefore, the force of gravity to extend as far as the moon, and to decrease according to this ratio, he computed whether that force would be sufficient to keep the moon in her orbit; but having no books at hand, by which he might ascertain the true magnitude of the earth, he was obliged to employ in his calculation the erroneous estimate at that time commonly received among geographers and seamen, namely, that a degree of latitude on the earth's surface was 60 English miles. Now, as the degree contains in reality about 69½ miles, his computation of course did not agree with the phenomena; and on this account, he laid aside at that time all further consideration of the subject. Some years after, in consequence of a letter he received from Dr. Hooke, he investigated the nature of the path which a body would describe, if it were let fall from any high place, taking into account the rotation of the earth; and on this occasion, he resumed his former train of reflections concerning the motion of the moon. He had now, however, the advantage of knowing pretty nearly the exact magnitude of the earth, in consequence of the measurement of an arc of the meridian made in France by Picard; and he had the inexpressible satisfaction of finding that his calculation agreed exactly with what it ought to be, if the opinion he had formed was correct. He therefore concluded that his conjecture was correct, and that the moon was really kept in her order by the force of gravity, which decreased according as the square of the distance increased, agreeably to what he had supposed. It is said, that as the calculations drew to a close, the mind of Newton was so much agitated by the importance of the discovery he was on the point of making, that he was obliged to desire a friend to finish them. This is not to be wondered at, when we consider the great revolution which he foresaw he was about to produce in the opinions of mankind, and the immense fabric of science that might be built on his discovery.

On these most interesting discoveries of Sir Isaac Newton, Dr. Hamilton, Bishop of Ossory, remarks, [See the Bishop's works, vol. ii. p. 335,] "The property of gravitation is not confined to the matter of which our earth is formed, but is found to be a general property of all bodies that come any way under our observation. Sir Isaac Newton has demonstrated that the moon gravitates towards the earth, and is retained in her orbit merely by that force. And since the revolution of the moon round Jupiter and Saturn, and of the primary planets round the sun, are phenomena or effects of the same kind with the revolution of our moon round the earth, he concludes, by the second rule of philosophizing, that all these effects must proceed from like causes, and therefore that the moons of Jupiter and Saturn gravitate towards their primaries, and that all the primary planets gravitate towards the sun. He has shown also, that if one body attracts another with any force, with the same force does that other body attract it; so that the earth must gravitate towards the moon, the sun towards the planets, and they all towards each other. He has proved likewise that the attractive forces of these great bodies act according to one universal and invariable law, which is, that every two of them attract each other with forces that are *directly* as their quantities of matter, and *inversely* as the square of the distance between their centres.

"Sir Isaac Newton's great discovery therefore consists in his having proved that the well known power, which we call gravity, acting throughout the solar system, according to the law above-mentioned, is the immediate cause which preserves the planets and comets in their motion round the sun; and that this force alone is fully sufficient to account for all the irregularities of the lunar motions, for the retrogression of the equinoctial points, and for the tides in our seas whose waters gravitate towards the moon.

"Sir Isaac, from some phenomena, was induced to suspect that the immediate cause of gravitation was mechanical, and that there existed throughout the universe a most subtile ethereal fluid, whose particles are so small as to pass freely through the pores of all bodies; and that these particles are endued with an exceeding strong repelling force, which makes the fluid vastly more rare and more elastic than our air, and of consequence vastly less able to resist the motion of bodies, and much more able to press upon gross bodies by endeavouring to expand itself. This ether, he supposes, must, from its repelling force, be much rarer within the dense bodies of the sun, planets, and comets, than in the empty spaces between them; and that in passing from them to greater distances it grows denser and denser perpetually, and thereby causes the gravity of these great bodies towards each other, and of their parts towards the bodies, every body endeavouring to go from the denser parts of this ether towards the rarer. All this however he proposes only as a conjecture, and leaves the truth of it to be determined by future experiments, and I have mentioned it here only because it is the conjecture of so great a philosopher."

Note B.—*The Planetary System.*

Since Goldsmith's time, five other planetary bodies, (Uranus, Ceres, Pallas, Juno, Vesta,) belonging to our solar system, have been discovered. On the 13th of March, 1781, Dr. Herschel discovered a new planet without the orbit of Saturn, which was first named by foreign astronomers, after its observer, the Herschel, but called by Herschel himself (in honour of George III.) the Georgium Sidus—although both these names are fast sinking, and Uranus is the appellation now almost universally adopted. Uranus is the most remote of all our planets, so far as discovered, circulating about the sun at the astonishing distance of 1,800 million miles, and performing its orbicular revolution in about 80 of our years. Its diameter is 35,112 miles. It has six secondary planets or moons. The other four planets are small. Ceres was discovered situated between the orbits of Mars and Jupiter, on the 1st of January, 1801, by M. Piazzi, a Sicilian astronomer. It performs its revolution round the sun in about four years. Pallas was discovered also situated between the orbits of Mars and Jupiter, on the 28th March, 1802, by Dr. Olbers of Bremen. Juno was discovered by Mr. Harding, at the observatory of Lilienthal, near Bremen, on the first day of September, 1804. It is likewise situated between the orbits of Mars and Jupiter; and performs its revolution round the sun in 5 years and 182 days. Vesta was discovered by Dr. Olbers, on the 29th of March, 1807. It is also situated between the orbits of Mars and Jupiter; and performs its revolution round the sun in 3 years and 182 days.—The diameters of these planets (which must, however, be considered as doubtful) have been given as follows:—Ceres, 1,024 miles; Pallas, 2,099 miles; Juno, 1,425 miles; Vesta, 238 miles. It was supposed by some astronomers that a planet existed between the orbits of Jupiter and Mars. The discovery of Ceres confirmed this conjecture; but the opinion which it seemed to establish respecting the harmony of the solar system, appeared to be completely overturned by the discovery of Pallas and Juno. Dr. Olbers, however, considers that these small celestial bodies are merely the fragments of a larger planet, which had been burst asunder by some internal convulsion, and that several more might yet be discovered between the orbits of Mars and Jupiter. Some writers suppose the meteoritic stones which fall upon our earth to be small portions of this dissevered planet. In Brewster's Encyclopædia a theory is started respecting the origin of Ceres and Pallas, which is plausible and curious. It is thus stated. "A comet appeared in the year 1770, and was carefully observed for nearly four months by M. Messier. When Prosperin and Pingre applied themselves to calculate the elements of its orbit, they found that a parabolic path would not represent the observations of Messier, and hence they suspected that its orbit might be sensibly elliptical. M. Lexell of St. Petersburg computed its elements in an elliptical orbit, and he found that its period was five years and a half, and that its greatest distance from the sun did not much exceed that of Jupiter. This curious subject was investigated rather unsuccessfully by Slop, Sejour, and Lambert; and a few years ago it attracted the particular notice of the National Institute of France. At the request of that learned body, Dr. Burckhardt repeated all the calculations with the utmost care, and the result of his investigations was a complete confirmation of Lexell's conclusions. Here, then, is a most singular anomaly in the motion of this comet. While all the other comets which have been observed, move in orbits stretching far beyond the limits of the solar system, and revolve in periods of long duration, the comet of 1770 never wanders beyond the orbit of Saturn, and completes its revolution in the short period of five years and a half. The return of this body, therefore, was confidently expected by astronomers; but though it must now have completed nearly eight revolutions round the sun, and though more observations have been made in the heavens during the last 40 years than perhaps during the two preceding centuries, yet the comet of 1770 has never re-appeared. We are consequently entitled to conclude, that the comet of 1770 is lost, which could happen only from its uniting with one of the planets, whose orbits it crossed. Now, if such a union took place, two consequences would obviously flow from it. The planet would suffer a sensible derangement in its motions, and its atmosphere would receive a vast accession of that nebulous matter, of which the comets are often wholly composed. Here, then, we have two distinct criteria to enable us to ascertain the individual planet by which the comet was attracted. The path of the comet intersects the orbits only of Venus, the Earth, Mars, the four new planets, and Jupiter, and therefore it must have united with one of these bodies, or with their satellites. Now, since the year 1770, neither Venus, the Earth, Mars, nor Jupiter, have suffered the smallest derangement of this kind, nor have they received any visible addition to their atmospheres. We must, therefore, look to the four new planets for some indication of the presence of a comet, and if they exhibit any phenomena that are unequivocally of this description, we must consider such a coincidence as a strong proof of the theory, or as one of the most wonderful facts in the history of science. Two of the new planets, Ceres and Pallas, exhibit, in the form and position of their orbits, evident marks of some great derangement; but as this may have arisen from that explosive force, by which they seem to have been separated from a larger planet, we are not entitled to regard it as a proof of the present theory. But though we cannot employ our first criterion either for or against the theory, the second applies with irresistible force, and we would entreat the particular attention of our readers to this single point. The two planets, Ceres and Pallas, are actually surrounded with atmospheres of an immense size. The tmosphere of Ceres is 675 English miles high, while hat of Pallas rises to the height of 468 miles. Now he height of any of these atmospheres is greater than the united heights of the atmospheres of all the other planets, and is above a thousand times higher than it ought to have been, according to the ratio which exists between the globes and the atmospheres of all the other bodies of the system. Astronomers were so forcibly struck with the magnitude of these atmospheres, that a dispute arose whether Ceres and Pallas should be called planets or comets, and the discussion terminated, by giving them the name of asteroids, a class of bodies which were supposed to partake of the nature both of planets and comets. But to draw this argument still closer upon the subject, let us inquire from what other source these atmospheres could be derived, if they were not imparted by the comet of 1770. If the four new planets are the fragments of a larger body, endowed with an extensive atmosphere, each fragment would obviously carry off a portion of atmosphere proportioned to its magnitude; but two of the fragments, Juno and Vesta, have no atmosphere at all, consequently the atmospheres of Ceres and Pallas could not have been derived from the original planet, but must have been communicated to them at a period posterior to the divergency of the fragments. It would have been a satisfactory addition to the preceding arguments, if we had been able to show, by direct calculation, that Ceres and Pallas were at the same instant with the comet in that part of their orbits which was crossed by its path, and that the position of the planes of the orbits was such, as to permit a near approximation. But as we have no data sufficiently correct for such a calculation, we must leave this part of the subject to some future opportunity. There is one fact, however, which in some measure supplies its place, and which is therefore worthy of particular notice. The nodes of the comet of 1770 lie exactly between the nodes of Ceres and Pallas, an arrangement which is absolutely indispensable to the truth of the preceding theory."

NOTE C.—*Comets.*

When examined through a good telescope, a comet resembles a mass of aqueous vapours encircling an opaque nucleus of different degrees of darkness in different comets, though sometimes, as in the case of several discovered by Dr. Herschel, no nucleus can be seen. As the comet advances towards the sun, its faint and nebulous light becomes more brilliant, and its luminous train gradually increases in length. When it reaches its perihelion the intensity of its light, and the length of its tail, reach their maximum, and sometimes it shines with all the splendour of Venus. During its retreat from the perihelion, it is shorn of its splendour, it gradually resumes its nebulous appearance, and its tail decreases in magnitude till it reaches such a distance from the earth, that the attenuated light of the sun, which it reflects, ceases to make an impression on the organ of sight. Traversing unseen the remote portion of its orbit, the comet wheels its ethereal course far beyond the limits of our system. What region it there visits, or upon what destination it is sent, the limited powers of man are unable to discover. After the lapse of years, we perceive it again returning to our system, and tracing a portion of the same orbit round the sun, which it had formerly described. It would be a waste of time to detail the various wild and extravagant opinions which have been entertained respecting these interesting stars. During the ages of barbarism and superstition, they were regarded as the harbingers of awful convulsions, both in the political and in the physical world. Wars, pestilence, and famine, the dethronement of kings, the fall of nations, and the more alarming convulsions of the globe, were the dreadful evils which they presented to the diseased and terrified imaginations of men. As the light of knowledge dissipated these gloomy apprehensions, the absurdities of licentious speculation supplied their place, and all the ingenuity of conjecture was exhausted in assigning some rational office to these wandering planets. Even at the beginning of the 18th century, the friend and companion of Newton regarded them as the abode of the damned. Anxious to know more than what is revealed, the fancy of speculative theologians strove to discover the frightful regions in which vice was to suffer its merited punishment; and the interior caverns of the earth had, in general, been regarded as the awful prison-house in which the Almighty was to dispense the severities of justice. Mr. Whiston, however, outstripped all his predecessors in fertility of invention. He pretended not only to fix the residence of the damned, but also the nature of their punishment. Wheeled from the remotest limits of the system, the chilling regions of darkness and cold, the comet wafted them into the very vicinity of the sun; and thus alternately hurried its wretched tenants to the terrifying extremes of chilling cold and devouring fire. By other astronomers, comets were destined for more scientific purposes. They were supposed to convey back to the planets the electric fluid which is constantly dissipating, or to supply the sun with the fuel which it perpetually consumes. They have been regarded also as the cause of the deluge; and we must confess, that if a natural cause is to be sought for that great event, we can explain it only by the shock of some celestial body. The transient effect of a comet passing near the earth, could scarcely amount to any great convulsion; but if the earth were actually to receive a direct impulse from one of these bodies, the consequences would be awful. A new direction would be given to its rotatory motion, and the globe would revolve round a new axis. The seas, forsaking their ancient beds, would be hurried by their centrifugal force, to the new equatorial regions; islands and continents, the abodes of men and animals, would be covered by the universal rush of the waters to the new equator, and every vestige of human industry and genius at once destroyed. The chances against such an event, however, are so very numerous, that there is no dread of its occurrence. Various opinions have been entertained by astronomers respecting the tails of comets. They were supposed by Appian, Cardan, and Tycho Brahe, to be the light of the sun transmitted through the nucleus of the comet, which they believed to be transparent like a lens. Kepler thought, that the impulsion of the solar rays drove away the denser parts of the comet's atmosphere, and thus formed the tail. Descartes ascribes the tail to the refraction of light by the nucleus. Newton maintained, that it is a thin vapour raised by the heat of the sun from the comet. Euler asserts that the tail is occasioned by the impulsion of the solar rays driving off the atmosphere of the comet; and that the curvature observed in the tail is the joint effect of this impulsive force, and the gravitation of the atmospherical particles to the solid nucleus. Mairan imagines that comets' tails are portions of the sun's atmosphere. Dr. Hamilton of Dublin supposes them to be streams of electric matter; and Biot supposes with Newton, that the tails are vapours produced by the excessive heat of the sun; and also, that the comets are solid bodies before they reach their perihelion; but that they are afterwards either partly or totally converted into vapour by the intensity of the solar heat. Of all these theories, that of Euler seems to be most philosophical. Since the comets are composed chiefly of nebulous matter, and have very large atmospheres, the external atmospheric strata must be drawn towards the comet by very slight powers of attraction, and will therefore yield to the smallest impulse. From the great density of the planets, on the contrary, and the small size of their atmospheres, the external strata are attracted towards them with a very great force, and therefore cannot yield, like those of the comets, to a slight impulse. Hence we see the reason why the comets have tails, while none of the planetary bodies exhibit such a phenomenon. Whatever opinion may be entertained of this explanation, it must, at least, be admitted, that if light is a material substance, the atmospherical particles of a comet may have their gravity diminished to such a degree, either by their distance from its centre, or by the rarity of the nucleus, as to yield to the impulse of the solar rays, and be forced behind the nucleus, in the same manner as smoke yields to the impulse of the gentlest breeze.

NOTE D.—*Fixed Stars.*

"The first thing which strikes a scientific observer of the fixed stars, is their immeasurable distance. If the whole planetary system were lighted up into a globe of fire, it would exceed, by many millions of times, the magnitude of this world, and yet only appear a small lucid point from the nearest of them. If a body were projected from the sun, with the velocity of a cannon-ball, it would take hundreds of thousands of years before it described that mighty interval which separates the nearest of the fixed stars from our sun and from our system. If this earth, which moves at more than the inconceivable velocity of a million and a half miles a-day, were to be hurried from its orbit, and to take the same rapid flight over this immense tract, it would not have arrived at the termination of its journey after taking all the time which has elapsed since the creation of the world. These are great numbers, and great calculations; and the mind feels its own impotency in attempting to grasp them. We can state them in words. We can exhibit them in figures. We can demonstrate them by the powers of a most rigid and infallible geometry. But, no human fancy can summon up a lively or an adequate conception—can roam in its ideal flight over this immeasurable largeness—can take in this mighty space in all its grandeur, and in all its immensity—can sweep the outer boundaries of such a creation—or lift itself up to the majesty of that great and invisible arm on which all is suspended.

"But what can those stars be which are seated so far beyond the limits of our planetary system! They must be masses of immense magnitude, or they could not be seen at the distance of place which they occupy. The light which they give must proceed from themselves; for the feeble reflection of light from some other quarter, would not carry through such mighty tracts to the eye of an observer. A body may be visible in two ways. It may be visible from its own light, as the flame of a candle, or the brightness of a fire, or the brilliancy of yonder glorious sun, which lightens all below, and is the lamp of the world. Or it may be visible from the light which falls upon it, as the body which receives its light from a taper, or the whole assemblage of objects on the surface of the earth, which appear only when the light of day rests upon them—or the moon, which, in that part of it that is towards the sun, gives out a silvery whiteness to the eye of the observer, while the other part forms a black and invisible space in the firmament—or as the planets, which shine only because the sun shines upon them; and which, each of them, present the appearance of a dark spot on the side that is turned away from it. Now apply this question to the fixed stars. Are they luminous of themselves, or do they derive their light from the sun, like the bodies of our planetary system? Think of their immense distance, and the solution of this question becomes evident. The sun, like any other body, must dwindle into a less apparent magnitude as you retire from it. At the

us distance even of the very nearest of the
rs, it must have shrunk into a small indi-
oint. In short, it must have become a star
d could shed no more light than a single
al of those glimmering myriads, the whole
ge of which cannot dissipate, and can scarce-
ate, the midnight darkness of our world.
tars are visible, not because the sun shines
em, but because they shine of themselves,
they are so many luminous bodies scattered
tracts of immensity; in a word, because
so many suns, each throned in the centre of
dominions, and pouring a flood of light over
portion of these unlimitable regions.

such an immense distance for observation,
to be supposed that we can collect many
resemblance between the fixed stars and
star, which forms the centre of our plane-
tem. There is one point of resemblance,
, which has not escaped the penetration of
onomers. We know that our sun turns
on himself in a regular period of time. We
w that there are dark spots scattered over
ce, which, though invisible to the naked
perfectly noticeable by our instruments. If
ts existed in greater quantity upon one side
n another, it would have the general effect
ng that side darker; and the revolution of
must, in such a case, give us a brighter and
side, by regular alternations. Now, there
of the fixed stars which present this appear-
They present us with periodical variations
From the splendour of a star of the first
d magnitude, they fade away into some of
rior magnitudes; and one, by becoming in-
might give reason to apprehend that we had
altogether; but we can still recognise him
elescope, till at length he reappears in his
e, and, after a regular lapse of so many days
rs, recovers his original brightness. Now,
inference from this is, that the fixed stars,
esemble our sun, in being so many luminous
of immense magnitude, they resemble him in
, that each of them turns round upon his
; so that, if any of them should have an
y in the brightness of their sides, this revo-
rendered evident, by the regular variations
gree of light which it undergoes.

ll we say, then, of these vast luminaries, that
re created in vain? Were they called into
e for no other purpose than to throw a tide
s splendour over the solitudes of immensity?
is only one of these luminaries, and we
at he has worlds in his train. Why should
the rest of this princely attendance? Why
each of them be the centre of his own sys-
give light to his own worlds? It is true
see them not; but could the eye of man take
into those distant regions, it would lose
our little world before it reached the outer
our system—the greater planets would dis-
their turn—before it had described a small
of that abyss which separates us from the
rs, the sun would decline into a little spot,
ts splendid retinue of worlds be lost in the
y of distance—he would at last shrink into a
divisible atom, and all that could be seen of
gnificent system, would be reduced to the
ng of a little star. Why resist any longer
d and interesting conclusion? Each of these
y be the token of a system as vast and as
as the one which we inhabit. Worlds roll
distant regions; and these worlds must be
ions of life and of intelligence. In yon gilded
f heaven, we see the broad aspect of the
, where each shining point presents us with
d each sun with a system of worlds—where
nity reigns in all the grandeur of His attributes—where He peoples immensity with his wonders; and travels in the greatness of His strength through the dominions of one vast and unlimited monarchy.

"The contemplation has no limits. If we ask the number of suns and of systems, the unassisted eye of man can take in a thousand, and the best telescope which the genius of man has constructed, can take in eighty millions. But why subject the dominions of the universe to the eye of man, or to the powers of his genius? Fancy may take its flight far beyond the ken of eye or of telescope. It may expatiate in the outer regions of all that is visible—and shall we have the boldness to say, that there is nothing there?—that the wonders of the Almighty are at an end, because we can no longer trace His footsteps?—that His omnipotence is exhausted because human art can no longer follow him?—that the creative energy of God has sunk into repose, because the imagination is enfeebled by the magnitude of its efforts, and can keep no longer on the wing through those mighty tracts, which shoot far beyond what eye hath seen, or the heart of man hath conceived—which sweep endlessly along, and merge into an awful and mysterious infinity."—*Chalmers' Astronomical Discourses.*

CHAP. II.

A SHORT SURVEY OF THE GLOBE, FROM THE LIGHT OF ASTRONOMY AND GEOGRAPHY.

All the sciences are, in some measure, linked with each other, and before the one is ended, the other begins. In a natural history, therefore, of the earth, we must begin with a short account of its situation and form, as given us by astronomers and geographers: it will be sufficient, however, upon this occasion, just to hint to the imagination, what they, by the most abstract reasonings, have forced upon the understanding. The earth which we inhabit is, as has been said before, one of those bodies which circulate in our solar system; it is placed at a happy middle distance from the centre; and even seems, in this respect, privileged beyond all other planets that depend upon our great luminary for their support. Less distant from the sun than Saturn, Jupiter, and Mars, and yet less parched up than Venus and Mercury, that are situated too near the violence of its power, the earth seems in a peculiar manner to share the bounty of the Creator: it is not, therefore, without reason, that mankind consider themselves as the peculiar objects of his providence and regard.

Besides that motion which the earth has round the sun, the circuit of which is performed in a year, it has another upon its own axis, which it performs in twenty-four hours. Thus, like a chariot-wheel, it has a compound motion; for while it goes forward on its journey, it is at the same time turning upon itself. From the first of these two arises the grateful vicissitude of the seasons; from the second, that of day and night.

It may be also readily conceived, that a body thus wheeling in circles will most probably be itself a sphere. The earth, beyond all possibility of doubt, is found to be so. Whenever its shadow happens to fall upon the moon, in an eclipse, it appears to be always circular, in whatever position it is projected; and it is easy to prove, that a body which in every position makes a circular shadow, must itself be round. The rotundity of the earth may be also proved from the meeting of two ships at sea: the topmasts of each are the first parts that are discovered by both, the under parts being hidden by the convexity of the globe which rises between them. The ships, in this instance, may be resembled to two men who approach each other on the opposite sides of a hill; their heads will first be seen, and gradually as they come nearer they will come entirely into view.[1]

However, though the earth's figure is said to be spherical, we ought only to conceive it as being nearly so. It has been found in the last age to be rather flatted at both poles, so that its form is commonly resembled to that of a turnip. The cause of this swelling of the equator is ascribed to the greater rapidity of the motion with which the parts of the earth are there carried round; and which, consequently, endeavouring to fly off, act in opposition to central attraction. The twirling of a mop may serve as a homely illustration; which, as every one has seen, spreads and grows broader in the middle as it continues to be turned round.

As the earth receives light and motion from the sun, so it derives much of its warmth and power of vegetation from the same beneficent source. However, the different parts of the globe participate of these advantages in very different proportions, and accordingly put on very different appearances; a polar prospect, and a landscape at the equator, are as opposite in their appearances as in their situation.

The polar regions, that receive the solar beams in a very oblique direction, and continue for one-half of the year in night, receive but few of the genial comforts which other parts of the world enjoy. Nothing can be more mournful or hideous than the picture which travellers present of those wretched regions. The ground,[2] which is rocky and barren, rears itself in every place in lofty mountains and inaccessible cliffs, and meets the mariner's eye at forty leagues from shore. These precipices, frightful in themselves, receive an additional horror from being constantly covered with ice and snow, which daily seem to accumulate, and to fill all the valleys with increasing desolation. The few rocks and cliffs that are bare of snow, look at a distance of a dark brown colour, and quite naked. Upon a nearer approach, however, they are found replete with many different veins of coloured stone, here and there spread over with a little earth, and a scanty portion of grass and heath. The internal parts of the country are still more desolate and deterring. In wandering through these solitudes, some plains appear covered with ice, that, at first glance, seem to promise the traveller an easy journey.[3] But these are even more formidable and more unpassable than the mountains themselves, being cleft with dreadful chasms, and everywhere abounding with pits that threaten certain destruction. The seas that surround these inhospitable coasts are still more astonishing, being covered with flakes of floating ice, that spread like extensive fields, or that rise out of the water like enormous mountains. These, which are composed of materials as clear and transparent as glass,[4] assume many strange and fantastic appearances. Some of them look like churches or castles, with pointed turrets; some like ships in full sail; and people have often given themselves the fruitless toil to attempt piloting the imaginary vessels into harbour. There are still others that appear like large islands, with plains, valleys, and hills, which often rear their heads two hundred yards above the level of the sea; and although the height of these be amazing, yet their depth beneath is still more so; some of them being found to sink three hundred fathom under water.

The earth presents a very different appearance at the equator, where the sunbeams, darting directly downwards, burn up the lighter soils into extensive sandy deserts, or quicken all the moister tracts with incredible vegetation. In these regions, almost all the same inconveniencies are felt from the proximity of the sun, that in the former were endured from its absence. The deserts are entirely barren, except where they are found to produce serpents, and in such quantities, that some extensive plains seem almost entirely covered with them.[5]

It not unfrequently happens also, that this dry soil, which is so parched and comminuted by the force of the sun, rises with the smallest breeze of wind; and the sands, being composed of parts almost as small as those of water, they assume a similar appearance, rolling onward in waves like those of a troubled sea, and overwhelming all they meet with inevitable destruction. On the other hand, those tracts which are fertile, teem with vegetation even to a noxious degree. The grass rises to such a height as often to require burning; the forests are impassable from underwoods, and so matted above, that even the sun, fierce as it is, can seldom penetrate.[6] These are so thick as scarcely to be extirpated; for the

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[1] Other proofs of the earth's rotundity might be adduced, the most practical of which is that derived from the many voyages performed around it—navigators pursuing a due course east or west having returned to the same place whence they set out, which could not have happened were the earth a plane.—ED.

[2] Crantz's History of Greenland, p. 3.

[3] Crantz's History of Greenland, p. 22.

[4] Ibid. p. 27.

[5] Adanson's Description of Senegal.

[6] Linnæi Amænit. vol. vi. p. 67

ing so bound together by the climbing
that grow round them, though a hundred
be cut at the bottom, yet not one would
they mutually support each other. In
ark and tangled forests, beasts of various
insects in astonishing abundance, and ser-
of surprising magnitude, find a quiet re-
om man, and are seldom disturbed except
other.

is manner the extremes of our globe seem
unfitted for the comforts and convenien-
life; and although the imagination may
awful pleasure in contemplating the
l precipices of Greenland, or the luxuri-
rdure of Africa, yet true happiness can
e found in the more moderate climates,
the gifts of nature may be enjoyed, with-
urring danger in obtaining them.

in the temperate zone, therefore, that all
s of improving nature, and refining upon
ess, have been invented: and this part of
th is, more properly speaking, the theatre
ral history. Although there be millions
als and vegetables in the unexplored for-
der the line, yet most of these may for
ntinue unknown, as curiosity is there re-
by surrounding danger. But it is other-
these delightful regions which we inhabit,
ere this art has had its beginning. Among
e is scarce a shrub, a flower, or an insect,
t its particular history; scarce a plant
uld be useful, which has not been propa-
nor a weed that could be noxious, which
been pointed out.

CHAP. III.

VIEW OF THE SURFACE OF THE EARTH.

we take a slight survey of the surface of
be, a thousand objects offer themselves,
though long known, yet still demand our
ty. The most obvious beauty that every-
strikes the eye is the verdant covering of
rth, which is formed by a happy mixture
bs and trees of various magnitudes and
It has been often remarked, that no colour
es the sight so much as green: and it
added, as a further proof of the assertion,
he inhabitants of those places where the
re continually white with snow, generally
blind long before the usual course of na-

advantage, which arises from the verdure
fields, is not a little improved by their
ble inequalities. There are scarcely two
l landscapes that offer prospects entirely
ling each other; their risings and depres-
their hills and valleys, are never entirely
ne, but always offer something new to en-
and refresh the imagination.

But to increase the beauties of the face of nature, the landscape is enlivened by springs and lakes, and intersected by rivulets. These lend a brightness to the prospect; give motion and coolness to the air; and, what is much more im portant, furnish health and subsistence to animated nature.

Such are the most obvious and tranquil objects that everywhere offer: but there are objects of a more awful and magnificent kind; the *mountain* rising above the clouds, and topped with snow; the *river* pouring down its sides, increasing as it runs, and losing itself, at last, in the ocean; the *ocean* spreading its immense sheet of waters over one-half of the globe, swelling and subsiding at well-known intervals, and forming a communication between the most distant parts of the earth.

If we leave those objects that seem to be natural to our earth, and keep the same constant tenor, we are presented with the great irregularities of nature: the burning mountain; the abrupt precipice; the unfathomable cavern; the headlong cataract; and the rapid whirlpool.

If we carry our curiosity a little further, and descend to the objects immediately below the surface of the globe, we shall there find wonders still as amazing. We first perceive the earth, for the most part, lying in regular beds or layers, every bed growing thicker in proportion as it lies deeper, and its contents more compact and heavy. We shall find, almost wherever we make our subterranean inquiry, an amazing number of shells that once belonged to aquatic animals. Here and there, at a distance from the sea, beds of oyster-shells, several yards thick, and many miles over; sometimes testaceous substances of various kinds on the tops of mountains, and often in the heart of the hardest marble. These, which are dug up by the peasants in every country, are regarded with little curiosity; for being so very common, they are considered as substances entirely terrene. But it is otherwise with the inquirer after nature, who finds them, not only in shape, but in substance, every way resembling those that are found in the sea; and he, therefore, is at a loss to account for their removal.

Yet not one part of nature alone, but all her productions and varieties, become the object of the speculative man's inquiry; he takes different views of nature from the inattentive spectator; and scarcely an appearance, how common soever, but affords matter for his contemplation; he inquires how and why the surface of the earth has those risings and depressions which most men call natural; he demands in what manner the mountains were formed, and in what consists their uses; he asks from whence springs arise, and how rivers flow round the convexity of the globe; he enters into an examination of the ebbings and flowings, and the other wonders of the deep; he acquaints himself with the irregularities of nature, and endeavours to investigate their causes; by which, at least, he will become better versed in their history. The internal structure of the globe becomes an object of his curiosity; and although his inquiries can fathom but a very little way, yet, if possessed with a spirit of theory, his imagination will supply the rest. He will endeavour to account for the situation of the marine fossils that are found in the earth, and for the appearance of the different beds of which it is composed. These have been the inquiries that have splendidly employed many of the philosophers of the last and present age,[1] and, to a certain degree, they must be serviceable. But the worst of it is, that, as speculations amuse the writer more than facts, they may be often carried to an extravagant length; and that time may be spent in reasoning upon nature, which might be more usefully employed in writing her history.

Too much speculation in natural history is certainly wrong; but there is a defect of an opposite nature that does much more prejudice; namely, that of silencing all inquiry, by alleging the benefits we receive from a thing, instead of investigating the cause of its production. If I inquire how a mountain came to be formed; such a reasoner, enumerating its benefits, answers, because God knew it would be useful. If I demand the cause of an earthquake, he finds some good produced by it, and alleges that as the cause of its explosion. Thus such an inquirer has constantly some ready reason for every appearance in nature, which serves to swell his periods, and give splendour to his declamation; every thing about him is, on some account or other, declared to be good; and he thinks it presumption to scrutinize its defects, or to endeavour to imagine how it might be better. Such writers, and there are many such, add very little to the advancement of knowledge. It is finely remarked by Bacon, that the investigation of final causes[2] is a barren study; and like a virgin dedicated to the Deity, brings forth nothing. In fact, those men who want to compel every appearance and every irregularity in nature into our service, and expatiate on their benefits, combat that very morality which they would seem to promote. God has permitted thousands of natural evils to exist in the world, because it is by their intervention that man is capable of moral evil; and he has permitted that we should be subject to moral evil, that we might do something to deserve eternal happiness, by showing that we had rectitude to avoid it.

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[1] Buffon, Woodward, Burnet, Whiston, Kircher, Bourquat, Leibnitz, Steno, Ray, &c.

[2] Investigatio causarum finalium sterilis est, et veluti virgo Deo dedicata nil parit.

CHAP. IV.

A REVIEW OF THE DIFFERENT THEORIES OF THE EARTH.

HUMAN invention has been exercised for several ages to account for the various irregularities of the earth. While those philosophers, mentioned in the last chapter, see nothing but beauty, symmetry, and order; there are others, who look upon the gloomy side of nature, enlarge on its defects, and seem to consider the earth, on which they tread, as one scene of extensive desolation.[1] Beneath its surface they observe minerals and waters confusedly jumbled together; its different beds of earth irregularly lying upon each other; mountains rising from places that once were level;[2] and hills sinking into valleys; whole regions swallowed by the sea, and others again rising out of its bosom. All these they suppose to be but a few of the changes that have been wrought in our globe; and they send out the imagination to describe its primeval state of beauty.

Of those who have written theories describing the manner of the original formation of the earth, or accounting for its present appearances, the most celebrated are Burnet, Whiston, Woodward, and Buffon. As speculation is endless, so it is not to be wondered that all these differ from each other, and give opposite accounts of the several changes, which they suppose our earth to have undergone. As the systems of each have had their admirers, it is, in some measure, incumbent upon the natural historian to be acquainted, at least, with their outlines; and, indeed, to know what others have even dreamed in matters of science is very useful, as it may often prevent us from indulging similar delusions ourselves, which we should never have adopted, but because we take them to be wholly our own. However, as entering into a detail of these theories is rather furnishing a history of opinions than things, I will endeavour to be as concise as I can.

The first who formed this amusement of earth-making into system, was the celebrated Thomas Burnet, a man of polite learning and rapid imagination. His *Sacred Theory*, as he calls it, describing the changes which the earth has undergone, or shall hereafter undergo, is well known for the warmth with which it is imagined, and the weakness with which it is reasoned; for the elegance of its style, and the meanness of its philosophy. "The earth," says he, "before the deluge, was very differently formed from what it is at present: it was at first a fluid mass; a chaos composed of various substances, differing both in density and figure: those which are most heavy, sunk to the centre, and formed in the middle of our globe a hard solid body; those of a lighter nature remained next; and the waters, which were lighter still, swam upon its surface, and covered the earth on every side. The air, and all those fluids which were lighter than water, floated upon this also; and in the same manner encompassed the globe; so that between the surrounding body of waters, and the circumambient air, there was formed a coat of oil, and other unctuous substances, lighter than water. However, as the air was still extremely impure, and must have carried up with it many of those earthy particles with which it once was intimately blended, it soon began to defecate, and to depose these particles upon the oily surface already mentioned, which soon uniting, the earth and oil formed that crust, which soon became a habitable surface, giving life to vegetation, and dwelling to animals.

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[1] Buffon's second discourse.

[2] Senec. Quæst. lib. vi. cap. 21.

"This imaginary antediluvian abode was very different from what we see it at present. The earth was light and rich, and formed of a substance entirely adapted to the feeble state of incipient vegetation; it was a uniform plain, everywhere covered with verdure; without mountains, without seas, or the smallest inequalities. It had no difference of seasons, for its equator was in the plane of the ecliptic, or, in other words, it turned directly opposite to the sun, so that it enjoyed one perpetual and luxuriant spring. However, this delightful face of nature did not long continue in the same state; for, after a time, it began to crack and open in fissures; a circumstance which always succeeds when the sun exhales the moisture from rich or marshy situations. The crimes of mankind had been for some time preparing to draw down the wrath of Heaven; and they, at length, induced the Deity to defer repairing these breaches in nature. Thus the chasms of the earth every day became wider, and, at length, they penetrated to the great abyss of waters; and the whole earth, in a manner, fell in Then ensued a total disorder in the uniform beauty of the first creation, the terrene surface of the globe being broken down: as it sunk the waters gushed out in its place; the deluge became universal; all mankind, except eight persons, were destroyed, and their posterity condemned to toil upon the ruins of desolated nature."

It only remains to mention the manner in which he relieves the earth from this universal wreck, which would seem to be as difficult as even its first formation. "These great masses of earth falling into the abyss, drew down with them vast quantities also of air; and, by dashing against each other, and breaking into small parts by the repeated violence of the shock, they at length left between them large cavities, filled with nothing but air. These cavities naturally offered a bed to receive the influent waters; and in proportion as they filled, the face of the earth became once more visible. The higher parts of its broken surface, now become the tops of mountains, were the first that appeared; the plains soon after came forward, and at length the whole globe was delivered from the waters, except the places in the lowest situations; so that the ocean and the seas are still a part of the ancient abyss, that have not had a place to return. Islands and rocks are fragments of the earth's former crust, kingdoms and continents are larger masses of its broken substance; and all the inequalities that are to be found on the surface of the present earth, are owing to the accidental confusion into which both earth and waters were then thrown."

The next theorist was Woodward, who, in his Essay towards a Natural History of the Earth, which was only designed to precede a greater work, has endeavoured to give a more rational account of its appearances; and was, in fact, much better furnished for such an undertaking than any of his predecessors, being one of the most assiduous naturalists of his time. His little book, therefore, contains many important facts, relative to natural history, although his system may be weak and groundless.

He begins by asserting that all terrene substances are disposed in beds of various natures, lying horizontally one over the other, somewhat like the coats of an onion; that they are replete with shells, and other productions of the sea; these shells being found in the deepest cavities, and on the tops of the highest mountains. From these observations, which are warranted by experience, he proceeds to observe, that these shells and extraneous fossils are not productions of the earth, but are all actual remains of those animals which they are known to resemble; that all the beds of the earth lie under each other, in the order of their specific gravity; and that they are disposed as if they had been left there by subsiding waters. All these assertions he affirms with much earnestness, although daily experience contradicts him in some of them; particularly we find layers of stone often over the lightest soils, and the softest earth under the hardest bodies. However, having taken it for granted, that all the layers of the earth are found in the order of their specific gravity, the lightest at the top, and the heaviest next the centre, he consequently asserts, and it will not improbably follow, that all the substances of which the earth is composed, were once in an actual state of dissolution. This universal dissolution he takes to have happened at the time of the flood. He supposes, that at that time a body of water which was then in the centre of the earth, uniting with that which was found on the surface, so far separated the terrene parts as to mix all together in one fluid mass; the contents of which afterwards sinking according to their respective gravities, produced the present appearances of the earth. Being aware, however, of an objection, that fossil substances are not found dissolved, he exempts them from this universal dissolution, and, for that purpose, endeavours to show that the parts of animals have a stronger cohesion than those of minerals; and that, while even the hardest rocks may be dissolved, bones and shells may still continue entire.

So much for Woodward; but of all the systems which were published respecting the earth's formation, that of Whiston was most applauded, and most opposed. Nor need we wonder: for being supported with all the parade of deep calculation, it awed the ignorant, and produced the approbation of such as would be thought otherwise; as it implied a knowledge of abstruse learning, to be even thought capable of comprehending what the writer aimed at. In fact, it is not easy to divest this theory of its mathematical garb; but those who have had leisure, have found the result of our philosopher's reasoning to be thus: He supposes the earth to have been originally a comet; and he considers the history of the creation, as given us in Scripture, to have its commencement just when it was, by the hand of the Creator, more regularly placed as a planet in our solar system. Before that time he supposes it to have been a globe without beauty or proportion; a world in disorder; subject to all the vicissitudes which comets endure; some of which have been found, at different times, a thousand times hotter than melted iron; at others, a thousand times colder than ice. These alternations of heat and cold, continually melting and freezing the surface of the earth, he supposes to have produced, to a certain depth, a chaos entirely resembling that described by the poets, surrounding the solid contents of the earth, which still continued unchanged in the midst, making a great burning globe of more than two thousand leagues in diameter. This surrounding chaos, however, was far from being solid: he resembles it to a dense, though fluid atmosphere, composed of substances mingled, agitated, and shocked against each other; and in this disorder he describes the earth to have been just at the eve of creation.

But upon its orbit being then changed, when it was more regularly wheeled round the sun, every thing took its proper place; every part of the surrounding fluid then fell into a situation, in proportion as it was light or heavy. The middle, or central part, which always remained unchanged, still continued so, retaining a part of that heat which it received in its primeval approaches towards the sun; which heat, he calculates, may continue for about six thousand years. Next to this fell the heavier parts of the chaotic atmosphere, which serve to sustain the lighter: but as in descending they could not entirely be separated from many watery parts, with which they were intimately mixed, they drew down a part of these also with them; and these could not mount again after the surface of the earth was consolidated: they, therefore, surrounded the heavy first-descending parts in the same manner as these surround the central globe. Thus the entire body of the earth is composed internally of a great burning globe: next which is placed a heavy terrene substance, that encompasses it; round which is also circumfused a body of water. Upon this body of water, the crust of earth, which we inhabit, is placed: so that, according to him, the globe is composed of a number of coats, or shells, one within the other, all of different densities. The body of the earth being thus formed, the air, which is the lightest substance of all, surrounded its surface; and the beams of the sun, darting through, produced that light which, we are told, first obeyed the Creator's command.

The whole economy of the creation being thus adjusted, it only remained to account for the risings and depressions on the surface of the earth, with the other seeming irregularities of its present appearance. The hills and valleys are considered by him as formed by their pressing upon the internal fluid, which sustains the outward shell of earth, with greater or less weight: those parts of the earth which are heaviest sink into the subjacent fluid more deeply, and become valleys: those that are lightest rise higher upon the earth's surface, and are called mountains.

Such was the face of nature before the deluge: the earth was then more fertile and populous than it is at present; the life of man and animals was extended to ten times its present duration; and all these advantages arose from the superior heat of the central globe, which ever since has been cooling. As its heat was then in full power, the genial principle was also much greater than at present; vegetation and animal increase were carried on with more vigour; and all nature seemed teeming with the seeds of life. But these physical advantages were only productive of moral evil: the warmth which invigorated the body increased the passions and appetites of the mind; and, as man became more powerful, he grew less innocent. It was found necessary to punish this depravity; and all living creatures were overwhelmed by the deluge in universal destruction.

This deluge, which simple believers are willing to ascribe to a miracle, philosophers have long been desirous to account for by natural causes; they have proved that the earth could never supply from any reservoir towards its centre, nor the atmosphere by any discharge from above, such a quantity of water as would cover the surface of the globe to a certain depth over the tops of our highest mountains. Where, therefore, was all this water to be found? Whiston has found enough, and more than a sufficiency, in the tail of a comet; for he seems to allot comets a very active part in the great operations of nature.

He calculates, with great seeming precision, the year, the month, and the day of the week, on which this comet (which has paid the earth some visits since, though at a kinder distance) involved our globe in its tail. The tail he supposed to be a vaporous fluid substance, exhaled from the body of the comet by the extreme heat of the sun, and increasing in proportion as it approached that great luminary. It was in this that our globe was involved at the time of the deluge; and, as the earth still acted by its natural attraction, it drew to itself all the watery vapours which were in the comet's tail; and the internal waters being also at the same time let loose, in a very short space the tops of the highest mountains were laid under the deep.

The punishment of the deluge being thus completed, and all the guilty destroyed, the earth, which had been broken by the eruption of the internal waters, was also enlarged by it; so that, upon the comet's recess, there was found room sufficient in the internal abyss for the recess of the superfluous waters; whither they all retired, and left the earth uncovered, but in some respects changed, particularly in its figure, which, from being round, was now become oblate. In this universal wreck of nature, Noah survived, by a variety of happy causes, to repeople the earth, and to give birth to a race of men slow in believing ill-imagined theories of the earth.

After so many theories of the earth which had been published, applauded, answered, and forgotten, Mr. Buffon ventured to add one more to the number. This philosopher was, in every respect, better qualified than any of his predecessors for such an attempt, being furnished with more materials, having a brighter imagination to find new proofs, and a better style to clothe them in. However, if one so ill-qualified as I am may judge, this seems the weakest part of his admirable work; and I could wish that he had been content with giving us facts instead of systems; that, instead of being a reasoner, he had contented himself with being merely an historian.

He begins his system by making a distinction between the first part of it and the last; the one being founded only on conjecture, the other depending entirely upon actual observation. The latter part of his theory may, therefore, be true, though the former should be found erroneous.

"The planets," says he, "and the earth among the number, might have been formerly (he only offers this as conjecture) a part of the body of the sun, and adherent to its substance. In this situation, a comet falling in upon that great body might have given it such a shock, and so shaken its whole frame, that some of its particles might have been driven off like streaming sparkles from red-hot iron; and each of these streams of fire, small as they were in comparison of the sun, might have been large enough to have made an earth as great, nay, many times greater, than ours. So that in this manner the planets, together with the globe which we inhabit, might have been driven off from the body of the sun by an impulsive force; in this manner also they would continue to recede from it for ever, were they not drawn back by its superior power of attraction; and thus, by the combination of the two motions, they are wheeled round in circles.

"Being in this manner detached at a distance from the body of the sun, the planets, from having been at first globes of liquid fire, gradually became cool. The earth also, having been impelled obliquely forward, received a rotatory motion upon its axis at the very instant of its formation; and this motion being greatest at the equator, the parts there acting against the force of gravity, they must have swollen out, and given the earth an oblate or flattened figure.

"As to its internal substance, our globe, having once belonged to the sun, it continues to be an uniform mass of melted matter, very probably vitrified in its primeval fusion. But its surface is very differently composed. Having been in the beginning heated to a degree equal to, if not greater, than what comets are found to sustain; like them it had an atmosphere of vapours floating round it, and which, cooling by degrees, condensed and subsided upon its surface. These vapours formed, according to their different densities, the earth, the water, and the air; the heavier parts falling first, and the lighter remaining still suspended."

Thus far our philosopher is, at least, as much a system-maker as Whiston or Burnet; and, indeed, he fights his way with great perseverance and ingenuity, through a thousand objections that naturally arise. Having, at last, got upon the earth, he supposes himself on firmer ground, and goes forward with greater security. Turning his attention to the present appearance of things upon this globe, he pronounces from the view, that the whole earth was at first under water. This water he supposes to have been the lighter parts of its former evaporation, which, while the earthy particles sunk downwards by their natural gravity, floated on the surface, and covered it for a considerable space of time.

"The surface of the earth," says he,[3] "must have been in the beginning much less solid than it is at present; and, consequently, the same causes which at this day produce but very slight changes, must then, upon so complying a substance, have had very considerable effects. We have no reason to doubt but that it was then covered with the waters of the sea; and that those waters were above the tops of our highest mountains; since, even in such elevated situations, we find shells and other marine productions in very great abundance. It appears also that the sea continued for a considerable time upon the face of the earth: for as these layers of shells are found so very frequent at such great depths, and in such prodigious quantities, it seems impossible for such numbers to have been supported all alive at one time; so that they must have been brought there by successive depositions. These shells also are found in the bodies of the hardest rocks, where they could not have been deposited, all at once, at the time of the deluge, or at any such instant revolution; since that would be to suppose, that all the rocks in which they are found, were, at that instant, in a state of dissolution, which would be absurd to assert. The sea, therefore, deposited them wheresoever they are now to be found, and that by slow and successive degrees.

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[3] Theorie de la Terre, vol. i. p. 111.

"It will appear also, that the sea covered the whole earth, from the appearance of its layers, which lying regularly one above the other, seem all to resemble the sediment formed at different times by the ocean. Hence, by the irregular force of its waves, and its currents driving the bottom into sand-banks, mountains must have been gradually formed within this universal covering of waters; and these successively raising their heads above its surface, must, in time, have formed the highest ridges of mountains upon land, together with continents, islands, and low grounds, all in their turns. This opinion will receive additional weight by considering, that in those parts of the earth where the power of the ocean is greatest, the inequalities on the surface of the earth are highest. The ocean's power is greatest at the equator, where its winds and tides are most constant; and, in fact, the mountains at the equator are found to be higher than in any other part of the world. The sea, therefore, has produced the principal changes in our earth; rivers, volcanoes, earthquakes, storms, and rain, having made but slight alterations, and only such as have affected the globe to very inconsiderable depths."

This is but a very slight sketch of Mr. Buffon's theory of the earth; a theory which he has much more powerfully supported than happily invented; and it would be needless to take up the reader's time from the pursuit of truth in the discussion of plausibilities. In fact, a thousand questions might be asked this most ingenious philosopher, which he would not find it easy to answer; but such is the lot of humanity, that a single Goth can in one day destroy the fabric which Cæsars were employed an age in erecting. We might ask, how mountains, which are composed of the most compact and ponderous substances, should be the first whose parts the sea began to remove? We might ask, how fossil-wood is found deeper even than shells? which argues, that trees grew upon the places he supposes once to have been covered with the ocean. But we hope this excellent man is better employed than to think of gratifying the petulance of incredulity, by answering endless objections.[4]

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[4] NOTE.—*Geological Theories.*

Since Goldsmith wrote, various other theories of the earth have been advanced, the most important of which are the Huttonian and Wernerian. Dr. Hutton supposes this globe to be regulated by a system of decay and renovation, and that these are effected by certain processes which bear a uniform relation to each other. The solid matter of the earth, especially the rocks and high lands, he supposes to be perpetually separating, by the reiterated action of air and water, and when thus detached, carried down by the streams and rivers and deposited in the beds of the ocean. From these deposites, the various strata of our earth are supposed to be formed, obtaining their consolidation from the action of submarine fires; which being placed at immense depths, must operate on these stratified depositions under the circumstance of vast pressure, by which volatilization must be prevented, and such changes produced as would not otherwise be effected by the power of heat. The expansive power of subterraneous fire is also called into explain, by the elevation of strata, their various positions. Thus, whilst the ocean is in one part removed by the accumulation and the elevation of strata, fresh receptacles are forming for it in other spots, where new strata will be deposited, consolidated, and elevated. According to this system, therefore, in the present world—which is made up of the fragments of those which preceded it—the materials are arranging for the formation of a new surface; new worlds are rising at the bottom of the present oceans; and imagination pictures successive lands overwhelmed by successive oceans, and these in turn producing new kingdoms, to be peopled by new nations; the system manifesting, as its author avowed, neither vestige of a beginning, nor prospect of an end.

According to Werner the earth is supposed to have existed originally in a state of aqueous fluidity, which is inferred from its spheroidical form, and from the highest mountains being composed of rocks, possessing a structure exactly resembling that of those fossils, which have, as it were, been formed under the eye by water. From this circumstance it also follows, that the ocean must have formerly stood very high over these mountains; and as these appear to have been formed during the same period of time, it follows, that the ocean must have formerly covered the whole earth at the same time. Contemplating the formation of the mountains themselves, Werner discovered the strongest proof of the diminution of the original waters of the globe. He ascertained, 1*st*, That the *outgoings*—that is, the upper extremities as they appear at the surface of the earth—of the newer strata are generally lower than the outgoings of the older, from granite downwards to the alluvial deposite—and that not in particular spots, but around the whole globe. 2*d*, That the primitive part of the earth is entirely composed of chemical precipitations, and that the mechanical depositions only appear in those of a later period, that is, in the transition class; and continue increasing through all the succeeding classes of rocks. This evidence of the vast diminution of water which stood so high over the whole earth, is assumed to be perfectly satisfactory, although we can form no correct idea of what has become of it. By the earliest separations from the chaotic mass which are discoverable in the crust of the globe, was formed a class of rocks, which are therefore termed *primitive rocks*. The circumstances which mark the high antiquity of these rocks are, that they form the fundamental rock of the other classes. Having been formed in the uninhabitable state of the globe, they contain no petrifactions, and, excepting the small portion which sometimes accompany those which will be next mentioned, they contain no mechanical deposites, but are, throughout, pure chemical productions. Small portions of carbonaceous matter occur only in the newer members of the class. Before the summits of the mountains appeared above the level of the ocean, and before the creation of vegetables and animals, a rising of the waters is supposed to have taken place, during which, that class of rocks which are said to be of the *second formation* was deposited. The rocks of this formation are clay, porphyry, pearl stone porphyry, obsidian porphyry, sienite, and pitchstone; they exhibit very few mechanical depositions, are of complete chemical formation, and contain little or no carbonaceous matter, and never any petrifactions. On the appearance of land, or during the transition of the earth from its chaotic to its habitable state, rocks which from this circumstance are denominated *transition rocks* were formed. In these rocks, the first slight traces of petrifaction, and of mechanical depositions, are to be found. As the former class of rocks were purely of chemical formation, so the contents of these are chiefly chemical productions, mingled with a small proportion of mechanical depositions; to explain the cause of the mixture, we are referred to the period of their formation, that at which the summits of the primitive mountains just appeared above the waters, when, by the attraction excited by the motion of the waves, and which we are reminded extended to no great depth, particles of the original mountains were worn off and deposited. As the height of the level of the ocean diminished, so would the surface on which its waves acted increase, and of course the number of mechanical depositions. Hence, these are much more abundant in the rocks of the next formation, which are denominated *floetz rocks*, on account of their being generally disposed in horizontal or flat strata. In these, petrifactions are very abundantly found, having been formed whilst vegetables and animals existed in great numbers. These rocks are generally of very wide extent, and commonly placed at the foot of primitive mountains; they are seldom of a very great height, from whence it may be inferred, that the water had considerably subsided at the time of their formation, and did not then cover the whole face of the earth. Countries composed of these rocks are not so rugged in their appearance, nor so marked by sudden inequalities, as those in which the primitive and transition rocks prevail. Most of the rocks which have been just enumerated, are covered by a great formation, which is named the *newest floetz trap*. This formation also covers many of the highest primitive mountains; it has but little continuity, but is very widely distributed. It contains considerable quantities of mechanical deposites, such as clay, sand, and gravel. The remains both of vegetables and animals also occur very abundantly in these deposites. Heaps of trees, and parts of plants, and an abundance of shells and other marine productions, with the horns of stags, and great beds of bituminous fossils, point out the lateness of the period when this formation was deposited. In this formation several rocks occur which are also met with in other floetz formations; but the following are supposed to be peculiar to this class: basalt, wacke, greystone, porphyry, slate, and trap tuff. These rocks are said to have been formed during the settling of the water consequent upon a vast deluge, which is supposed to have taken place when the surface of the earth was covered with animals and vegetables, and when much dry land existed. From various appearances observed in these rocks, it is concluded, that the waters in which they were formed had risen with great rapidity, and had afterwards settled into a state of considerable calmness. The collections and deposites derived from the materials of pre-existing masses, worn down by the powerful agency of air and water, and afterwards deposited on the land, or on the sea-coast, are termed *alluvial*, and are, of course, of much later formation than any of the preceding classes. These deposites may be divided into: 1*st*, Those which are formed in mountainous countries, and are found in valleys, being composed of rolled masses, gravel, sand, and sometimes loam, fragments of ores, and different kinds of precious stones. 2*d*, Those which occur in low and flat countries, being peat, sand, loam, bog, iron ore, nagelflech, calc-tuff and calc-sinter; the three latter being better known by the names breccia, tufa, and stalactite.

Every part of the surface of this globe, M. Cuvier maintains, exhibits such phenomena, as unavoidably lead to the conclusion that the sea, at one period or another, has covered the whole, and remained for a long time in a state of tranquillity so as to form those regular and extensive horizontal deposites in which many of the marine exuviæ are contained. But there are also inclined or vertical strata of the same nature, situated under the horizontal strata, which having been necessarily formed in a horizontal position, have been subsequently lifted up and shifted into their inclined or vertical situation, and that too before the horizontal strata were deposited above them. Now amid these changes it was hardly possible that the same species of animals should continue to live. There must have been a succession of changes in animal natures corresponding to that in the chemical properties of the fluid which they inhabited. It is also conceivable that the change of element might be so great as to cause the entire destruction of all existing genera. Accordingly, not only the species, but even the genera, change with the strata; and when the sea last receded from our continent, its inhabitants were not very different from those which it continues to support. The strata around us, therefore, may serve the double purpose of recording the great revolutions which have taken place both in the animal kingdom and upon the surface of the globe. Neither physical nor astronomical causes of revolution on the earth's surface are sufficient to explain these changes. The irruption of the sea and its retreat have neither been slow nor gradual; the catastrophes have been sudden, and the present surface of the world is by no means of very ancient formation. This theory approximates more nearly to the Mosaical record than many others which we have noticed. In fact, modern geologists are all eager to bear testimony to the actual occurrence of the deluge.

CHAP. V.

OF FOSSIL-SHELLS, AND OTHER EXTRANEOUS FOSSILS.

WE may affirm of Mr. Buffon, that which has been said of the chemists of old; though he may have failed in attaining his principal aim, of establishing a theory, yet he has brought together such a multitude of facts relative to the history of the earth, and the nature of its fossil productions, that curiosity finds ample compensation, even while it feels the want of conviction.

Before, therefore, I enter upon the description of those parts of the earth which seem more naturally to fall within the subject, it will not be improper to give a short history of those animal productions that are found in such quantities, either upon its surface, or at different depths below it. They demand our curiosity; and, indeed, there is nothing in natural history that has afforded more scope for doubt, conjecture, and speculation. Whatever depths of the earth we examine, or at whatever distance within land we seek, we most commonly find a number of fossil-shells, which being compared with others from the sea, of known kinds, are found to be exactly of a similar shape and nature.[1] They are found at the very bottom of quarries and mines, in the retired and inmost parts of the most firm and solid rocks, upon the tops of even the highest hills and mountains, as well as in the valleys and plains; and this not in one country alone, but in all places where there is any digging for marble, chalk, or any other terrestrial matters, that are so compact as to fence off the external injuries of the air, and thus preserve these shells from decay.

These marine substances, so commonly diffused, and so generally to be met with, were for a long time considered by philosophers as productions, not of the sea, but of the earth. "As we find that spars," said they, "always shoot into peculiar shapes, so these seeming snails, cockles, and mussel-shells, are only sportive forms that nature assumes amongst others of its mineral varieties: they have the shape of fish, indeed, but they have always been terrestrial animals."[2]

With this plausible solution mankind were for a long time content; but upon closer inquiry, they were obliged to alter their opinion. It was found that these shells had in every respect the properties of animal, and not of mineral nature. They were found exactly of the same weight with their fellow-shells upon shore. They answered all the chemical trials in the same manner as sea-shells do. Their parts, when dissolved, had the same appearance to view, the same smell and taste. They had the same effects in medicine, when inwardly administered; and, in a word, were so exactly conformable to marine bodies, that they had all the accidental concretions growing to them, (such as pearls, corals, and smaller shells,) which are found in shells just gathered on the shore. They were, therefore, from these considerations, given back to the sea; but the wonder was, how to account for their coming so far from their own natural element upon land.[3]

As this naturally gave rise to many conjectures, it is not to be wondered that some among them have been very extraordinary. An Italian, quoted by Mr. Buffon, supposes them to have been deposited in the earth at the time of the crusades, by the pilgrims who returned from Jerusalem; who gathering them upon the sea-shore, in their return carried them to their different places of habitation. But this conjecturer seems to have but a very inadequate idea of their numbers. At Touraine, in France, more than a hundred miles from the sea, there is a plain of about nine leagues long, and as many broad, whence the peasants of the country supply themselves with marl for manuring their lands. They seldom dig deeper than twenty feet; and the whole plain is composed of the same materials, which are shells of various kinds, without the smallest portion of earth between them. Here then is a large space, in which are deposited millions of tons of shells, that pilgrims could not have collected, though their whole employment had been nothing else. England is furnished with its beds, which, though not quite so extensive, yet are equally wonderful. "Near Reading, in Berkshire, for many succeeding generations, a continued body of oyster-shells has been found through the whole circumference of five or six acres of ground. The foundation of these shells is a hard rocky chalk; and above this chalk, the oyster-shells lie in a bed of green sand, upon a level, as nigh as can possibly be judged, and about two feet thickness."[4] These shells are in their natural state, but they were found also petrified, and almost in equal abundance,[5] in all the Alpine rocks, in the Pyrenees, on the hills of France,[6] England, and Flanders. Even in all quarries from whence marble is dug, if the rocks be split perpendicularly downwards, petrified shells and other marine substances will be plainly discerned.

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[1] Woodward's Essay towards a Natural History, p. 16.

[2] Lowthorp's Abridgment, Phil. Trans. vol. ii. p. 426.

[3] Woodward, p. 43. See Supplementary Note A, p. 76.

[4] Phil. Trans. vol. ii. p. 427.

[5] Buffon, vol. i. p. 407.

[6] At a spot within less than a mile from Tournus, a deposite of recent marine shells was discovered in 1844, enveloped in an unctuous clay of a greenish grey colour. They were of two species,—the ostrea hippopus (a variety of the oyster), and the murex trunculus (a shell with many spines),—both still living on the southern and western shores of France. Tournus is about fifty miles north from Lyons. The spot where they were found is near the Saone, 230 miles from the Mediterranean, and 175 metres, or 573 English feet, above the level of the sea. The complete preservation of the oysters will not permit us to suppose that the shells have been carried to the place at any period less or more remote, and we are forced to conclude that they have been deposited by the sea, and of course that the land has been raised to the extent mentioned. We have evidence, therefore, that the soil of thi part of France was covered by the sea when thes shells were deposited. The low lands extendin from the Cevennes to the western skirts of the Alp must then have formed a long narrow firth or inlet shaped like the Forth, but five times as long, an broad in proportion. By a subsequent movemen these lands have been raised about 600 feet. A what epoch this change took place we have no dat to determine, but it was probably some thousan years anterior to historical records. We have analogous examples of recent marine shells found in Sweden and in Britain some hundred feet above the se With the evidence which the boulder clay furnishe of the sea having covered the land to a much greate height than this, the existence of the shells the locality mentioned has nothing incredible in i The more difficult fact to explain is, why the shel are found so rarely, since facts like this prove th they are capable of being preserved. The probab lity is, that it depends on the nature of the alluvi cover.—*Abridged from Scotsman newspaper*

"About a quarter of a mile from the river Medway, in the county of Kent, after the taking off the coping of a piece of ground there, the workmen came to a blue marble, which continued for three feet and a-half deep, or more, and then beneath appeared a hard floor or pavement, composed of petrified shells crowded closely together. This layer was about an inch deep, and several yards over; and it could be walked upon as upon a beach. These stones, of which it was composed, (the describer supposes them to have always been stones,) were either wreathed as snails, or bivalvular like cockles. The wreathed kinds were about the size of a hazel-nut, and were filled with a stony substance of the colour of marl; and they themselves also, till they were washed, were of the same colour; but when cleaned, they appeared of the colour of bezoar, and of the same polish. After boiling in water they became whitish, and left a chalkiness upon the fingers."[7]

In several parts of Asia and Africa, travellers have observed these shells in great abundance. In the mountains of Castravan, which lie above the city Barut, they quarry out a white stone, every part of which contains petrified fishes in great numbers, and of surprising diversity. They also seem to continue in such preservation, that their fins, scales, and all the minutest distinctions of their make, can be perfectly discerned.[8]

From all these instances we may conclude, that fossils are very numerous: and, indeed, independent of their situation, they afford no small entertainment to observe them as preserved in the cabinets of the curious. The varieties of their kinds are astonishing. Most of the sea-shells which are known, and many others to which we are entirely strangers, are to be seen either in their natural state, or in various degrees of petrifaction.[9] In the place of some we have mere spar, or stone, exactly expressing all the lineaments of animals, as having been wholly formed from them. For it has happened, that the shells dissolving by very slow degrees, and the matter having nicely and exactly filled all the cavities within, this matter, after the shells have perished, has preserved exactly and regularly the whole print of their internal surface. Of these there are various kinds found in our pits; many of them resembling those of our own shores; and many others that are only to be found on the coasts of other countries. There are some shells resembling those that are never stranded upon our coasts;[10] but always remain in the deep:[11] and many more there are which we can assimilate with no shells that are known amongst us. But we find not only shells in our pits, but also fishes and corals in great abundance; together with almost every sort of marine production.

It is extraordinary enough, however, that the common red coral, though so very frequent at sea, is scarcely seen in the fossil world; nor is there any account of its having ever been met with. But to compensate for this, there are all the kinds of the white coral now known, and many other kinds of that substance with which we are unacquainted. Of animals there are various parts: the vertebræ of whales, and the mouths of lesser fishes; these, with teeth also of various kinds, are found in the cabinets of the curious; where they receive long Greek names, which it is neither the intention nor the province of this work to enumerate. Indeed, few readers would think themselves much improved, should I proceed with enumerating the various classes of the Conicthyodontes, Polyleptoginglimi, or the Orthoceratites. These names, which mean no great matter when they are explained, may serve to guide in the furnishing a cabinet; but they are of very little service in furnishing the page of instructive history.

From all these instances we see in what abundance petrifactions are to be found; and, indeed, Mr. Buffon, to whose accounts we have added some, has not been sparing in the variety of his quotations, concerning the places where they are mostly to be found. However, I am surprised that he should have omitted the mention of one, which, in some measure, more than any of the rest, would have served to strengthen his theory. We are informed, by almost every traveller[12] that has described the pyramids of Egypt, that one of them is entirely built of a kind of freestone, in which these petrified shells are found in great abundance. This being the case, it may be conjectured, as we have accounts of these pyramids among the earliest records of mankind, and of their being built so long before the age of Herodotus, who lived but fifteen hundred years after the flood, that even the Egyptian priests could tell neither the time nor the cause of their erection; I say, it may be conjectured that they were erected but a short time after the flood. It is not very likely, therefore, that the marine substances found in one of them, had time to be formed into a part of the solid stone, either during the deluge, or immediately after it; and, consequently, their petrifaction must have been before that period. And this is the opinion Mr. Buffon has so strenuously endeavoured to maintain; having given specious reasons to prove, that such shells were laid in the beds where they are now found, not only before the deluge, but even antecedent to the formation of man, at the time the whole earth, as he supposes, was buried beneath a covering of waters.

But while there are many reasons to persuade us that these extraneous fossils have been deposited by the sea, there is one fact that will abundantly serve to convince us, that the earth was habitable, if not inhabited, before these marine substances came to be thus deposited. For we find fossil-trees, which no doubt once grew upon the earth, as deep, and as much in the body of solid rocks, as these shells are found to be. Some of these fallen trees also have lain at least as long, if not longer, in the earth, than the shells, as they have been found sunk deep in a marly substance, composed of decayed shells and other marine productions. Mr. Buffon has proved that fossil-shells could not have been deposited in such quantities all at once by the flood; and I think, from the above instance, it is pretty plain, that, howsoever they were deposited, the earth was covered with trees before their deposition; and, consequently, that the sea could not have made a very permanent stay. How then shall we account for these extraordinary appearances in nature? A suspension of all assent is certainly the first, although the most mortifying conduct. For my own part, were I to offer a conjecture, and all that has been said upon this subject is but conjecture, instead of supposing them to be the remains of animals belonging to the sea, I would consider them rather as bred in the numerous fresh-water lakes, that in primeval times covered the face of uncultivated nature. Some of these shells we know to belong to fresh waters; some can be assimilated to none of the marine shells now known;[13] why, therefore, may we not as well ascribe the production of all to fresh waters, where we do not find them as we do that of the latter to the sea only, where we never find them? We know that lakes, and lands also, have produced animals that are now no longer existing; why, therefore, might not these fossil productions be among the number? I grant that this is making a very harsh supposition; but I cannot avoid thinking that it is not attended with so many embarrassments as some of the former, and that it is much easier to believe that these shells were bred in fresh water, than that the sea had for a long time covered the tops of the highest mountains.[14]

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[7] Phil. Trans. p. 426. [8] Buffon, vol. i. p. 408.
[9] Hill, p. 646. [10] Littorales. [11] Pelagii.

[12] Hasselquist, Sandys.

NOTE A.

"It is curious to observe," says a writer in the 18th volume of the 'Edinburgh Review,' "how different an impression the same natural appearances have made on the human mind in different states of its improvement. A phenomenon which, in one age, has excited the greatest terror, has, in another, been an object of calm and deliberate observation; and the things which have at one time led to the most extravagant fiction, have, at another, only served to define the boundaries of knowledge. The same comet which, from the age of Julius Cæsar, had three times spread terror and dismay through the nations of the earth, appeared a fourth time, in the age of Newton, to instruct mankind, and to exemplify the universality of the laws which that great interpreter of nature had discovered. The same fossil remains, which, to St. Augustine or Kircher, seemed to prove the former existence of giants of the human species, were found, by Pallas and Cuvier, to ascertain the nature and character of certain genera and species of quadrupeds which have now entirely disappeared. From a very early period, indeed, such bones have afforded a measure of the credulity, not of the vulgar only, but of the philosophers. Theophrastus, one of the ancients who had most devoted himself to the study of nature, believed, as Pliny tells us, that bones were a sort of mineral production that originated and grew in the earth. St. Augustine says, that he found, on the sea-shore near Utica, a fossil human tooth, which was a hundred times the size of the tooth of any person living. Pliny says, that, by an earthquake in Crete, a part of a mountain was opened, which discovered a skeleton sixteen cubits, or twenty-four feet long, supposed to be that of Orion. At a much later period, Kircher tells us of a skeleton dug up near Rome, which, by an inscription attached to it, was known to be that of Pallas (slain by Turnus), and was higher than the walls of the city. The same author tells us, that another skeleton was found near Palermo, that must have belonged to a man four hundred feet high, and who therefore could be no other than one of the Cyclops, most probably Polyphemus himself. The same author has given the measures of several other colossal men, and exhibits them in an engraving adapted to a scale, and placed in order, from the common size up to that of the giant last mentioned. The belief in men of such enormous stature, no doubt arose from the appearance of bones of elephants, and other large animals found in the earth. When we consider, that the credulity and misinterpretation that are here so striking, are not the errors of the weak and illiterate, but of men of talents and learning—the best instructed by reading, conversation, and foreign travel, of any in the ages in which they lived,—we cannot help being struck with the difference between the criterion of truth as received in those ages and in the present time.

NOTE B.—*Organic Remains.*

Mr. Kirwan remarks, that petrifications are most commonly found in strata or marl, chalk, limestone, or clay; seldom in sand-stone, still more rarely in gypsum, &c. They sometimes occur among ores, and almost always consist of the species of earth, stone, or other mineral, which immediately surrounds them. Those of shells are generally found nearest the surface of the earth, those of fish deeper, and those of wood deepest. A very remarkable circumstance is, that petrifactions are found in climates where their originals could not have existed. From the gradual and insensible concretion of this kind of matter from dropping waters, are found the large pendulous columns, hanging like icicles from the roofs and sides of caves. The most remarkable are in the Peak of Derbyshire. Sometimes they are found in the arches of old bridges, and arise from water oozing through, and carrying particles of lime with it. Petrifactions occur in three states; sometimes they are a little altered; sometimes they are converted into stone; and sometimes only the impressions of them, or the moulds in which they have been enclosed, remain. Wood occurs in great abundance in many parts of England, buried at various depths under the surface, and very little altered either in its texture or properties. Pit-coal is supposed to be of vegetable origin. One circumstance confirms this opinion, namely, the existence of vast depositions of matter, half-way, as it were, between perfect wood and perfect pit-coal; betraying obviously its vegetable nature, and yet so nearly approximating to pit-coal in several respects, that it has been generally distinguished by the name of coal.

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[13] Hill's Fossils, p. 641.

[14] See Supplementary Note B.

omplete treatise on geological botany has
appeared in this country. Mr. Parkinson's
lume, it is true, is dedicated to the considera-
the vegetable kingdom. It contains descrip-
d beautiful figures of many varieties of fossil
lants, flowers, seeds, and fruits, from various
Europe, and treats of the mineral and petri-
rocesses to which they have been subjected.
the period this writer commenced his labours,
matic classification or nomenclature had been
nor was it known that this class of fossils was
erous. The great source whence our geolo-
ve hitherto drawn their knowledge of ante-
plants, is the splendid work, the 'Flora der
t' of Count Sternberg. In England the coal
ons are particularly rich in beautifully pre-
plants; and Mr. E. T. Artis, in his 'Antedi-
Phytology,' has drawn his illustrations from
il plants peculiar to this formation. So far as
mit of comparison, they approach those tribes
which now exist in warm climates, and luxu-
moist situations. They consist chiefly of
nd arborescent ferns, succulent plants, cacti,
biæ, canes, reeds, and gramina. The trunks or
hus discovered, belong principally to arundina-
lants, approximating to those now known,
o the palmaceous order, and partly to ano-
forms, constituting a transition between these
coniferous plants. From the few comparisons
have been hitherto instituted between the
f various distant coal-fields, there is reason
lude that they have a general resemblance
arts of the world; and if so, it contributes to
h a fact, on which much speculation has been
ed, of the original uniformity of climate at
emote points on the earth's surface. In an
in Silliman's Journal, it is said that fossil
which are now the natives of torrid climates,
een found in considerable numbers in the
f Ohio and in the vicinity of Ohio river.
these plants are the bread-fruit tree, the
of the palm which produces the cocoa-nut,
bamboo. The writer states that he has in
session the perfect impression of the cassia
tea-leaf found in the rocks of that region.
pressions of the bread-fruit tree show the
fully expanded and entire, and the author
hat his specimens of these fossil-plants are
ect and faithful to nature as to dispel all
of what they once were. The larger trees
nd mostly in sandstone. The supposition,
e author, that these tropical plants were
northward by the ocean, is disproved by
that some of the trees, or rather the roots
ts of their trunks, stand upright evidently on
t where they grew, and others with every
ntire, lie to appearance where they fell
urned up by the roots. "Again," asks the
"if floated from tropical regions, how hap-
that their flowers were uninjured? These
l their original beauty of form; they are fully
ed, and could not have been transported from
siderable distance. Scarcely a day could have
ned between the period in which they were
bloom and that in which, by that catastrophe
long since overwhelmed our globe, they were
med' in the spot where they are now found."
mulations of trees, called "subterranean for-
nay be traced at intervals, along our eastern

Some of them, apparently, are the remains
ts which clothed the surface of our soil prior
ast great geological epoch. Most of the trees
class, although broken off, overwhelmed by
dous violence, and often flattened by the pres-
f diluvial and alluvial deposits, appear to
their original sites; their stumps still remain
in the soil on which they evidently once
ed. In the north of Sweden, lignites or
subterraneous fossil forests not unfrequently occur, at a greater or less depth, in a state of high preservation. All these trees, perfect in form, though broken by an irresistible force, are felled in the same direction, and always present their summits pointing towards the south. They are strewn on the ground on which they had grown, with the exception of the oaks, many of which appeared to have been torn up by the roots; yet the oak no longer grows under the high latitudes in which these forests are found. These lignites have been much confounded with others of obvious postdiluvian lacustrine origin. Mosses, confervæ, and other equally delicate vegetable substances, preserved in agate and chalcedony, have been examined by Dr. MacCulloch, who is inclined to refer their origin to a period nearly coeval with the earliest existence of organic matter. Naturalists have often failed in their endeavours to identify the antediluvian plants with those now existing. They evidently flourished under a warm climate; but botanists hesitate to pronounce upon the species, or even the genera. In one instance, lately, a fossil plant has been determined with unusual precision. Under the name Trichomanes rotundatus, Mr. Lindley has described a vegetable, discovered within a nodule of argillaceous ironstone, which plant he does not hesitate to identify closely with one which is now only known to exist in the deep forests of New Zealand.

"There is," says a writer in the 'Bombay Times,' "scarcely, perhaps, a spectacle on the surface of the globe more remarkable, either in a geological or picturesque point of view, than that presented by the petrified forest near Cairo. The traveller having passed the tombs of the caliphs, just beyond the gates of the city, proceeds to the southward nearly at right angles to the road, across the desert to Suez; and, after having travelled some ten miles up a low barren valley covered with sand, gravel, and sea-shells, fresh as if the tide had retired but yesterday, crosses a low range of sand-hills, which has for some distance run parallel to his path. The scene now presented to him is beyond conception singular and desolate. A mass of fragments of trees, all converted into stone, and, when struck by his horse's hoof, ringing like cast-iron, is seen to extend itself for miles and miles around him in the form of a decayed and prostrate forest. The wood is of a dark brown hue, but retains its form in perfection, the pieces being from 1 to 15 feet in length, and from half a foot to three feet in thickness, strewed so thickly together, as far as the eye can reach, that an Egyptian donkey can scarcely thread its way through amongst them, and so natural, that were it in Scotland or Ireland, it might pass without remark for some enormous drained bog, on which the exhumed trees lay rotting in the sun. The roots and rudiments of the branches are, in many cases, nearly perfect, and in some the wormholes eaten under the bark are readily recognizable. The most delicate of the sap-vessels, and all the finer portions of the centre of the wood, are perfectly entire, and bear to be examined with the strongest magnifiers. The whole are so thoroughly silicified, as to scratch glass, and to be capable of receiving the highest polish."

The following is Baron Schlotheim's classification of the antediluvian plants contained in his cabinet: His specimens are first divided into five sections, or perhaps their more proper names would be orders.

I. DENDROLITHES, containing the remains of trees, which are subdivided into three subsections.

A. Lithoxylites, of which no characters are given, but from the specimens mentioned by him, he evidently arranges in this place the wood-stone and wood-opal of the mineralogists.

B. Lithantracites. In which the Baron places the bituminized stems, and other parts of trees.

C. Bibliolithes. Fossil leaves, mostly of the latter formations.

2. Botanolithes. Comprising those kinds of fossil plants which cannot be considered either as trees or shrubs, nor belonging to the plants of the old coal formation.

All the specimens belonging to the preceding sections are merely enumerated, and not distinguished by generic and trivial names, as is the case with the following.

3. Phytotypolithes. Fossil plants of the stone coal formation. These the Baron divides systematically into genera and species. The genera are these six:

a. Palmacites, containing fifteen species.
b. Casuarinites, containing five.
c. Calamites, containing ten.
d. Filicites, containing twenty-three.
e. Lycopodiolithes, containing five.
f. Poacites, containing four.

In the whole sixty-two species.

4. Carpolithes. Of which Baron Schlotheim enumerates fifteen species at present in his collection. This division is considered as a genus, as is also the next.

5. Anthotypolithes. The baron's cabinet contains only one species, namely the Anthotypolithes ranunculiformis.

Zoophytes, which form the link between vegetables and shellfish, are little less obscure than the plants; and we are again struck with the want of agreement between the organic productions of the ancient and of the present world. As far as the investigation has been pursued, it would seem that the zoophytes of those remote and mysterious times were not less numerous and beautiful than those of our own days. Mr. Parkinson examined 170 fossil corals, and found nearly the whole differed from any that are now known. "In my attempt," says this able observer, "to preserve a parallel between the recent and the fossil species, I have been most completely foiled. Indeed, so little could this parallel be preserved, that I am under the necessity of acknowledging I am not certain of the existence of the recent analogue of any one mineralized coral."

When the shellfish that inhabit our ocean are compared with the fossil tribes, essential specific differences are perceived; and these differences become more striking as we recede from the latest formations. In our crag and fresh-water beds some species may be discovered which possess a strong similarity, if not absolute identity, with those living in our lakes and seas. Even here, the identity is maintained but by a limited number, which are intermixed with numerous others that have no recent analogues. Investigations in fossil conchology lead, therefore, to one result; that, with the inconsiderable exceptions that have been stated, the species have not been perpetuated to our times. One of the most remarkable facts elicited is, that certain testacea, whose genera were abundantly preserved and prolonged through so many formations, should now exist so sparingly, or be entirely lost. We might instance the terebratulæ, which abound no less in the mountain limestone than in the chalk, and in almost every intermediate rock, which are absent in nearly every one of our tertiary beds, and re-appear in the most recent. Not less than 100 fossil species of terebratulæ, and myriads of individuals, are known to us; but the recent shells of this genus are comparatively few. Of trigonia, also, 25 species are found in our strata, often abundantly, and terminating, like the ammonites, with the chalk. Until lately, this genus was considered to be extinct; but one species has been discovered on the shores of New Holland. Of ammonites, so profusely distributed, whose species amount, it is said, to no less than 200, and of which about 175 are known in the English formations, none now remain: 29 species of producta, 3 of pentamerus, and 19 of spirifer, inhabited the waters that produced the transition and mountain limestone, and contiguous shales; but these genera are altogether extinct. Indeed, almost the whole series of antediluvian multilocular shells seem to have shared a similar fate. On the other hand, instances are no less abundant and striking, where the recent species comprehended under certain genera do greatly outnumber the fossils. Thus, under the Linnæan genus conus are comprised 155 species existing; but only 3 occur fossil in our London clay. The genus cypræa contains about 110 living species, and only four fossil in the tertiary beds. Thus, during the revolutions of ages, some races have been extinguished, and have given place to others which may still be traced in our seas. In the great tertiary deposites of the Sub-Apennines, Brocchi conceived he could point out some marine shells, which are now very widely dispersed in the Indian and American oceans, the Atlantic, the Red sea, the Persian gulf, and the coasts of Africa and Jamaica.

When we consider the enormous proportion of insects to the rest of the animated beings in the present world,—being, according to Baron Humboldt, no less than 44,000 out of 51,700,—we might expect to discover more frequent traces of these tribes in the fossil world. Whether they did not prevail in such numbers during the former period of the globe, or whether, as is most probable, the extreme delicacy of their structure was unfavourable to their preservation, we have only the fact, that but scanty traces of their former existence, particularly in the elder beds, do now appear.

Of birds the remains also are of rare occurrence, and the same remark might be applied to them, with respect to proportion, as to the preceding order. It does seem a singular circumstance, that more birds have not been found fossil, when we consider that they now are, as regards species, five times as numerous as the mammalia.

Of fishes, the most common form in which they are found is compressed between the laminæ of sandstones, schists, calcareous slates, and Purbeck marble. Their teeth, scales, and vertebræ are abundant in many formations between the lias and London clay, particularly in the latter, and are even yet more plentiful in the Suffolk crag beds. These teeth are commonly ascribed to varieties of sharks. A vast collection of impressions of fish have long been known to exist in the calcareous schist of Monte Bolca, many of which have been identified with living species. In M. Bozza's collection, out of 100 known fishes, 4 were ascertained to be similar to those living in the seas of Otaheite. In the Paris museum, containing 62 species, 28 are said to be common to European seas; 14 to Indian seas; 2 to African; 13 to South American; and 5 to North American. In another collection, of 105 species, from the same place, M. Saussure decided that 34 resemble those of European seas; 39 Asiatic; 3 African; 18 South American; 11 North American.

Of oviparous quadrupeds *(amphibia,)* several genera are now known in different formations; but it does not appear that the fossil skeletons of these animals assimilate precisely to living species. By far the greater number are of extraordinary conformation. Thus, the plesiosaurus approaches to the genus crocodile, but possesses double the number of vertebræ; a neck resembling the body of a serpent the head of a lizard; instead of feet, it has swimmers like a whale, or paddles like those of turtles, and in other respects its proportions present some approach to those animals. The ichthyosaurus recedes from the form of the lizard family, and in the structure of its vertebræ it approaches that of fishes. It has forty-one cervical and dorsal vertebræ, and is also furnished with paddles, intermediate between feet and fins. This genus exhibits the snout of a dolphin, the teeth of a crocodile, the head and sternum of a lizard, the swimmers of a whale, and the vertebræ of a fish. Found in the lias, Stonesfield slate, Oxford clay, Kimmeridge clay, coral rag or Malton oolite, and probably in other formations. The megalosaurus, or gigantic lizard of Stonesfield and Tilgate forest, is computed by Dr. Buckland to be 40 feet long. It possesses resemblances both to the monitors and the crocodiles. Mr. Mantell estimates the iguanodon, the great herbivorous reptile of the Tilgate stone, to have far exceeded the last in magnitude, and to have attained the extraordinary length of 60 feet. This appears to have been an inhabitant of fresh-water lakes and rivers. Vertebræ of another saurian animal have been discovered in the Portland series at Thame, near Oxford, of still more extraordinary dimensions. They are twice as large as those of the iguanodon, and four times the size of the vertebræ of the mastodon. Several gigantic bidental fossil lizards of extinct genera, were discovered near the Cape of Good Hope, in 1843, by Mr. A. G. Bain, of the Royal Engineers. Mr. Bain designated them bidentals, from their possessing only two teeth, or rather tusks, in the upper jaw, and none whatever in the lower jaw. Their jaws, he says, were doubtless covered with a horny serrated substance, like the turtle; and as they appear to have been aquatic reptiles, the tusks may have been used, as by the recent walrus, and extinct dinotherium, although they are smaller in proportion than those of the latter creature. The largest bidental skull might have been, when whole, of the size of the head of an hippopotamus. Professor Owen has given these bidental reptiles the generic name dicynodon, founded on the two canine tusks. He places the dicynodon in the lacertian order of reptiles. It combines in itself characters of the lizard, crocodile, and tortoise, with a form and internal structure of tusks now found only in mammalia. The tusks are placed in deep sockets in the upper maxillary bone, curved downwards nearly to a quadrant, and nourished by continuous growth from a hollow conical base like the tusks of the elephant; in all these points differing from any other reptiles, and anticipating conditions of mammalia. To these tusks in the upper edentulous jaw is added a horny mandible. The lower jaw is compounded of several bones, and, as in the turtles, without teeth, being covered with a horny case. The tusks, when examined by the microscope, are found to be composed of dentine, resembling ivory, having calcigerous tubes one-twelve-thousandth part of an inch in diameter; they do not appear to have been much worn, and were probably not used for providing food, but as weapons of offence and defence, descending from the upper jaw only, as in the living musk of Thibet, and in the extinct machairodus of Europe and America. The dicynodon, as in many recent and extinct lizards, had a small cranian cavity for the brain. Professor Owen has established three distinct species of dicynodon, namely, D. lacerticeps, D. testudliceps, and D. strigiceps; lizard-headed, tortoise-headed, and ridgy-headed. The dicynodon appears to have been one of the first created genera of saurians, and in the composite character of its organization, especially in the condition of the tusks, exhibits in one of the earliest forms of reptiles the presence of organs which now exist only in mammals; thus showing that the most ancient reptiles were in certain parts of their structure more highly organized than any genera which succeeded them in the transitory fossil series of that great family, or than any living reptiles; and in this fact we find an addition to the many other proofs afforded by geology of the want of sound foundations in that theory of *development* which would derive the various species and genera of animals, that have followed one another during the deposition of geological formations, from the transmutation of more simple into more complex forms of organization. So also among fossil fishes, some of the earlier forms, so far from being the most simply organized, are more compound than those which followed them in the epochs of more recent secondary and tertiary formations, and than those which exist in our present seas: *e. g.* the saurichthys combine some of the more complex and highly organized conditions of the structure of the lizard with the more simple conditions of the fish. The nearest approximation among fossil reptiles to the character of the dicynodon occurs in the rhynochosaurus, or beaked lizard, found by Dr. Ward in the new red sandstone at Grinsill, near Shrewsbury. The rhynochosaurus is one of the many reptiles whose footsteps abound on the surfaces of strata in the new red sandstone formation. Its head, like that of birds and turtles, had no teeth. But the rhynochosaurus had no tusks; as far as we know, these organs are peculiar to the dicynodon in the family of reptiles. It is probable that the strata on which these extinct forms of reptiles have been found in the southern extremity of Africa, are coeval with the new red sandstone which contains the earliest known fossil reptiles in Europe; and which has lately afforded three species of palæosaurus at Bristol. The district in which Mr. Bain found these fossil bones, which form so interesting an accession to palæontology, is an elevated plain, nearly 200 miles wide and 600 miles long, extending north-west from Algoa bay and Graham's town, and divided by a chain of hills from the district adjacent to the Cape. The Stonesfield slate contains perhaps one of the most remarkable assemblages of organic remains that are known to geologists. Here are marine, amphibious, and terrestrial animals, associated with terrestrial, fluviatile or lacustrine, and marine plants, and with birds and insects, all collected in a bed whose greatest thickness does not exceed 6 feet. Pterodactylus, or winged lizard, one of the most extraordinary productions of the fossil world, is an animal which forms the intermediate link, hitherto deemed to exist only in fable, between birds and reptiles. This creature, previously known in two formations upon the continent, has been recently recognised in the lias of Dorsetshire. Traces of tortoises are observed in the bituminous schist of the north of Scotland, the geological situation of which is probably similar to that of the coal-measures of England. Impressions, resembling the footsteps made by tortoises, were not long since noticed on the surface of beds of new red sandstone in Dumfries-shire. Bones of several cetaceous animals occur in marine diluvium, particularly in Norfolk. They have been traced much earlier in the Stonesfield slate, in the Tilgate stone, the Kimmeridge clay, and in limestone near Bath. Their occurrence is somewhat rare with us, but less so on some parts of the continent. In Italy, entire skeletons, at 1,200 feet elevation. Baron Cuvier enumerates 10 fossil species. One is like a species native of the Ganges; a second has no close affinity with any known species; while the remaining eight bear a resemblance to the species at present natives of the British seas. Among the most remarkable additions to the fauna of the ancient world, is the colossochelys, whose remains were discovered in the Sub-Himalayan hills by Captains Cautley and Falconer. It is a gigantic fossil turtle whose length was about eighteen feet, and its height at least seven. Here was a monster creeping on feet, whose carapace or shell would have formed a respectable dining-room, and whose weight and bulk would have freighted a moderate steamer.

With regard to the geological distribution of fossil quadrupeds, Baron Cuvier observed that mammiferous sea animals are in more ancient strata than mammiferous land animals; oviparous quadrupeds than viviparous quadrupeds. The oviparous quadrupeds apparently began to exist at the same time with the fishes; the land quadrupeds not until long after, and after the period when most of the shells were deposited.

On comparing the antediluvian animals with those existing, it is seen that the principal loss has fallen upon the carnivora, while the ruminants are preserved. Another singular fact has been elicited through the labours of the baron. The fossil ruminants appertain precisely to the genera and sub-genera at present most common in the northern climates: to the aurochs, the musk-ox, the elk, and the reindeer; while the fossil pachydermata, the elephant, the rhinoceros, the hippopotamus, and the tapir, are limited at present to the torrid zone. Remains of carnivorous animals are frequently found in our island. The supposed antediluvian fissures of rocks, chiefly in the mountain limestone, red sandstone, and oolite, are their principal receptacles. They are derived from several extinct species of hyænas, wolf, tiger, bear, and weasel. In Yorkshire, an interesting discovery has been made of the bones of the lion and wolf mixed with those of large herbivorous animals, in lacustrine marl, beneath diluvial gravel. Baron Cuvier describes 20 or more species of fossil carnivora, including several small species from the quarries of Mont-martre.

Herbivorous quadrupeds occupy the same geological position with the foregoing fossil mammalia. The larger animals of this class are found to possess anatomical differences from those now existing. The pachydermata are thick-skinned herbivorous quadrupeds, having more than two toes to the foot, and incisive teeth in both jaws. The Kirkdale cave has furnished bones of the elephant, rhinoceros, hippopotamus, and horse. Bones of the elephant or mammoth are among the most abundant in every part of the globe. We have derived numerous specimens from Suffolk and Norfolk. The mastodon, although figured in some works on English geology, does not appear to have been authenticated as a British fossil animal. The peculiar structure of the teeth and bones of these animals has been fully illustrated in various scientific publications. An extinct quadruped of this order, named by Cuvier, anoplotherium, found in the plaster quarries of Paris, appears in a single instance to have been traced in the lower fresh-water beds of the Isle of Wight. Nearly forty species of extinct pachydermata are found in the upper deposites of the Paris environs. Among them are numerous skeletons resembling tapirs and camels, some other species of rhinoceroses and the new genus palæotheria, and three or four others. Bones of the horse are found in similar situations to the foregoing, and were therefore contemporaneous with those extinct pachydermata. Remains of the ox, the aurochs or bison, and several species of deer, were observed in the cave of Kirkdale, and they occur, more or less, in all the great diluvial deposites of this country, and in the valleys through which our great rivers pass. Skulls of the Bos Urus at Walton-Naze, Woolwich, Ilford, &c. The great fossil elk of Ireland is found in peat bogs and gravel beds. Some of these skeletons have been met with, although rarely, in England, at Walton and in Holderness. Cervus elaphus, or red deer; common in diluvial gravel of the eastern counties. Cervus dama, or fallow deer; traced occasionally in similar situations. Cervus capreolus, or antelope; near Ipswich, and at Roydon, Norfolk.—Of the rodentia or gnawers, the Kirkdale cave alone yielded to the researches of Dr. Buckland the genera hare, rabbit, rat, water-rat, and mouse. Of quadrumanous animals there exist no known traces in this or any other part of the globe, either of the ape, monkey, or the human species. In alluvial deposites, calcareous incrustations, peat formations, mines, and volcanic debris, human bones and their accompaniments have frequently been discovered, bearing evidence of very high antiquity; but they are all referable to more recent times than the deluge, and may be explained by similar events of ordinary occurrence. One of the richest deposites of fossils in Europe is in the department of Gers, at the north foot of the Pyrenees. From eight to ten thousand bones or fragments have been collected, belonging to 98 genera, sub-genera, or species of mammalia and reptiles; 91 of these were from Sansan, a village 10 miles south from Auch, and yet only about one-twentieth part of the locality has been explored. The mammalia include, 1 quadrumana (ape), 11 insectivora, 18 carnivora, 11 rodentia, 1 or 2 edentata, 21 pachydermata, 11 ruminantia, with some doubtful indications of marsupialia. The reptiles include 5 turtles, 5 saurians, 1 serpent, 3 salamanders, 6 frogs, 1 unknown genus, and 1 gigantic reptile. M. Lartet is of opinion that these races—which occur in the upper tertiary beds—were destroyed by floods descending from the Pyrenees, but less violent than those which deposited the diluvium. All the animals are of extinct species; but the remains show that moles, hedgehogs, squirrels, hares, deers, lizards, and salamanders, much less than those now existing, lived in the district with the mastodon, rhinoceros, dinotherium, the sloth, and carnivorous animals of gigantic size.

No works of art, or other indications of the former existence of man, occur in diluvial or tertiary beds. We are therefore led to unite in the opinion that he is among "the most recent tenants of the globe," coincident with the oldest records and traditions of his race; and that the time in which he has inhabited the earth forms but a trifling portion of its absolute duration. Whether man was coeval with the mastodons, the mammoths, and other mighty animals that once ranged the earth, and left their traces on so large a part of its surface, is an inquiry which there seems little probability will ever be solved. At present we have only the negative fact, that no human remains have been discovered of equal antiquity with those extinct races of animals of which we have made brief mention in this imperfect sketch.

CHAP. VI.

OF THE INTERNAL STRUCTURE OF THE EARTH.

HAVING, in some measure, got free from the regions of conjecture, let us now proceed to a description of the earth as we find it by examination, and observe its internal composition, as far as it has been the subject of experience, or exposed to human inquiry. These inquiries, indeed, have been carried but to a very little depth below its surface, and even in that disquisition men have been conducted more by motives of avarice than of curiosity. The deepest mine, which is that at Cotteberg in Hungary,[1] reaches not more than three thousand feet deep; but what proportion does that bear to the depth of the terrestrial globe, down to the centre, which is above four thousand miles? All, therefore, that has been said of the earth, to a deeper degree, is merely fabulous or conjectural: we may suppose, with one, that it is a globe of glass;[2] with another, a sphere of heated iron;[3] with a third, a great mass of waters;[4] and with a fourth, one dreadful volcano:[5] but let us at the same time show our consciousness, that all these are but suppositions.

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[1] Boyle, vol. iii. p. 240.

Upon examining the earth, where it has been opened to any depth, the first thing that occurs, is the different layers or beds of which it is composed; these all lying horizontally one over the other, like the leaves of a book, and each of them composed of materials that increase in weight in proportion as they lie deeper. This is, in general, the disposition of the different materials, where the earth seems to have remained unmolested; but this order is frequently inverted; and we cannot tell whether from its original formation, or from accidental causes. Of different substances, thus disposed, the far greatest part of our globe consists, from its surface downwards to the greatest depths we ever dig or mine.[6]

The first layer most commonly found at the surface is that light coat of blackish mould, which is called by some *garden earth*. With this the earth is everywhere invested, unless it be washed off by rains, or removed by some other external violence. This seems to have been formed from animal and vegetable bodies decaying, and thus turning into its substance. It also serves again as a storehouse, from whence animal and vegetable nature are renewed: and thus are all vital blessings continued with unceasing circulation. This earth, however, is not to be supposed entirely pure, but is mixed with much stony and gravelly matter, from the layers lying immediately beneath it. It generally happens, that the soil is fertile in proportion to the quantity that this putrified mould bears to the gravelly mixture; and as the former predominates, so far is the vegetation upon it more luxuriant. It is this external covering that supplies man with all the true riches he enjoys. He may bring up gold and jewels from greater depths; but they are merely the toys of a capricious being, things upon which he has placed an imaginary value, and for which fools alone part with the more substantial blessings of life. "It is this earth," says Pliny,[7] "that, like a kind mother, receives us at our birth, and sustains us when born." It is this alone of all the elements around us, that is never found an enemy to man. The body of waters deluge him with rains, oppress him with hail, and drown him with inundations. The air rushes in storms, prepares the tempest, or lights up the volcano; but the earth, gentle and indulgent, ever subservient to the wants of man, spreads his walks with flowers, and his table with plenty; returns with interest every good committed to her care; and though she produces the poison, she still supplies the antidote; though constantly teased more to furnish the luxuries of man than his necessities, yet even to the last she continues her kind indulgence, and when life is over, she piously covers his remains in her bosom.

This external and fruitful layer which covers the earth, is, as was said, in a state of continual change. Vegetables, which are naturally fixed and rooted to the same place, receive their adventitious nourishment from the surrounding earth and water; animals, which change from place to place, are supported by these, or by each other. Both, however, having for a time enjoyed a life adapted to their nature, give back to the earth those spoils, which they had borrowed for a very short space, yet still to be quickened again into fresh existence. But the deposites they make are of very dissimilar kinds, and the earth is very differently enriched by their continuance: those countries that have for a long time supported men and other animals, having been observed to become every day more barren; while, on the contrary, those desolate places, in which vegetables only are abundantly produced, are known to be possessed of amazing fertility. "In regions which are uninhabited,"[8] says Mr. Buffon, "where the forests are not cut down, and where animals do not feed upon the plants, the bed of vegetable earth is constantly increasing. In all woods, and even in those which are often cut, there is a layer of earth of six or eight inches thick, which has been formed by the leaves, branches, and bark, which fall and rot upon the ground. I have frequently observed on a Roman way, which crosses Burgundy, for a long extent, that there is a bed of black earth, of more than a foot thick, gathered over the stony pavement, on which several trees, of a very considerable size, are supported. This I have found to be nothing else than an earth formed by decayed leaves and branches, which have been converted by time into a black soil. Now, as vegetables draw much more of their nourishment from the air and water than they do from the earth, it must follow that in rotting upon the ground, they must give more to the soil than they have taken from it. Hence, therefore, in woods kept a long time without cutting, the soil below increases to a considerable depth; and such we actually find the soil in those American wilds, where the forests have been undisturbed for ages. But it is otherwise where men and animals have long subsisted: for as they make a considerable consumption of wood and plants, both for firing and other uses, they take more from the earth than they return to it; it follows, therefore, that the bed of vegetable earth, in an inhabited country, must be always diminishing; and must at length resemble the soil of Arabia Petrea, and other provinces of the East, which having been long inhabited, are now become plains of salt and sand; the fixed salt always remaining, while the other volatile parts have flown away."

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[2] Buffon. [3] Whiston. [4] Burnet.
[5] Kircher. [6] Woodward, p. 9.
[7] Plinii Historia Naturalis, lib. ii. cap. 63.

[8] Buffon, vol. i. p. 353.

If from this external surface we descend deeper, and view the earth cut perpendicularly downwards, either in the banks of great rivers, or steepy sea-shores, or going still deeper, if we observe it in quarries or mines, we shall find its layers regularly disposed in their proper order. We must not expect, however, to find them of the same kind or thickness in every place, as they differ in different soils or situations.[9] Sometimes marl is seen to be over sand, and sometimes under it. The most common disposition is, that under the first earth is found gravel or sand, then clay or marl, then chalk or coal, marbles, ores, sands, gravels; and thus an alternation of these substances, each growing more dense as it sinks deeper. The clay, for instance, found at the depth of a hundred feet, is usually more heavy than that found not far from the surface. In a well which was dug at Amsterdam, to the depth of two hundred and thirty feet, the following substances were found in succession:[10] seven feet of vegetable earth, nine of turf, nine of soft clay, eight of sand, four of earth, ten of clay, four of earth, ten of sand, two of clay, four of white sand, one of soft earth, fourteen of sand, eight of clay mixed with sand, four of sea-sand mixed with shells, then a hundred and two feet of soft clay, and then thirty-one feet of sand.

In a well dug at Marly, to the depth of a hundred feet, Mr. Buffon gives us a still more exact enumeration of its layers of earth. "Thirteen of a reddish gravel, two of gravel mingled with a vitrifiable sand, three of mud or slime, two of marl, four of marly stone, five of marl in dust mixed with vitrifiable sand, six of very fine vitrifiable sand, three of earthy marl, three of hard marl, one of gravel, one of eglantine, a stone of the hardness and grain of marble, one of gravelly marl, one of stony marl, one of a coarser kind of stony marl, two of a coarser kind still, one of vitrifiable sand mixed with fossil-shells, two of fine gravel, three of stony marl, one of coarse powdered marl, one of stone calcinable like marble, three of gray sand, two of white sand, one of red sand streaked with white, eight of gray sand with shells, three of very fine sand, three of a hard gray stone, four of red sand streaked with white, three of white sand, and fifteen of reddish vitrifiable sand."

In this manner the earth is everywhere found in beds over beds; and, what is still remarkable, each of them, as far as it extends, always maintains exactly the same thickness. It is found also, that as we proceed to considerable depths, every layer grows thicker. Thus in the adduced instances we might have observed, that the last layer was fifteen feet thick, while most of the others were not above eight; and this might have gone much deeper, for aught we can tell, as before they got through it the workmen ceased digging.

These layers are sometimes very extensive, and often are found to spread over a space of some leagues in circumference. But it must not be supposed that they are uniformly continued over the whole globe without any interruption; on the contrary, they are ever at small intervals cracked through as it were by perpendicular fissures: the earth resembling, in this respect, the muddy bottom of a pond, from whence the water has been dried off by the sun, and thus gaping in several chinks, which descend in a direction perpendicular to its surface. These fissures are many times found empty, but oftener closed up with adventitious substances, that the rain, or some other accidental causes, have conveyed to fill their cavities. Their openings are not less different than their contents, some being not above half-an-inch wide, some a foot, and some several hundred yards asunder. Which last form those dreadful chasms that are to be found in the Alps, at the edge of which the traveller stands dreading to look down at the immeasurable gulf below. These amazing clefts are well known to such as have passed these mountains, where a chasm frequently presents itself several hundred feet deep, and as many over, at the edge of which the way lies. It often happens, also, that the road leads along the bottom, and then the spectator observes on each side frightful precipices several hundred yards above him; the sides of which correspond so exactly with each other, that they evidently seem torn asunder.

But these chasms, to be found in the Alps, are nothing to what Ovale tells us are to be seen in the Andes. These amazing mountains, in comparison of which the former are but little hills, have their fissures in proportion to their greatness. In some places they are a mile wide, and deep in proportion; and there are some others, that, running under ground, in extent resemble a province.

Of this kind also is that cavern called Eldenhole, in Derbyshire, which, Dr. Plott tells us, was sounded by a line of eight and twenty hundred feet, without finding the bottom or meeting with water: and yet the mouth at the top is not above forty yards over.[11] This immeasurable cavern runs perpendicularly downward; and the sides of it seem to tally so plainly as to show that they were once united. Those who come to visit the place, generally procure stones to be thrown into its mouth; and these are heard for several minutes, falling and striking against the sides of the cavern, producing a sound that resembles distant thunder, dying away as the stone goes deeper.[12]

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[9] See Supplementary Note, p. 83.

[10] Varenius, as quoted by Mr. Buffon, p. 358.

[11] Phil. Trans. vol. ii. p. 370.

[12] Dr. Plott has exaggerated the width and depth of this fearful cavern. Mr. Lloyd, who descended into it, found its depth to be 186 feet. Its mouth is 20 feet wide one way, and fifty another. He

Of this kind also is that dreadful cavern described by Elian; his account of which the reader may not have met with.[13] "In the country of the Arrian Indians, is to be seen an amazing chasm, which is called The Gulf of Plato. The depth and the recesses of this horrid place are as extensive as they are unknown. Neither the natives, nor the curious who visit it, are able to tell how it was first made, or to what depths it descends. The Indians continually drive thither great multitudes of animals, more than three thousand at a time, of different kinds, sheep, horses, and goats; and, with an absurd superstition, force them into the cavity, from whence they never return. Their several sounds, however, are heard as they descend; the bleating of sheep, the lowing of oxen, and the neighing of horses, issuing up to the mouth of the cavern. Nor do these sounds cease, as the place is continually furnished with a fresh supply."

There are many more of these dreadful perpendicular fissures in different parts of the earth; with accounts of which Kircher, Gaffarellus, and others who have given histories of the wonders of the subterranean world, abundantly supply us. The generality of readers, however, will consider them with less astonishment when they are informed of their being common all over the earth; that in every field, and every quarry, these perpendicular fissures are to be found, either still gaping, or filled with matter that has accidentally closed their interstices. The inattentive spectator neglects the inquiry, but their being common is partly the cause that excites the philosopher's attention to them: the irregularities of nature he is often content to let pass unexamined; but when a constant and a common appearance presents itself, every return of the object is a fresh call to his curiosity; and the chink in the next quarry becomes as great a matter of wonder as the chasm in Eldenhole. Philosophers have long, therefore, endeavoured to find out the cause of these perpendicular fissures, which our own countrymen, Woodward and Ray, were the first that found to be so common and universal. Mr. Buffon supposes them to be cracks made by the sun, in drying up the earth, immediately after its immersion from the deep. The heat of the sun is very probably a principal cause; but it is not right to ascribe to one only, what we find may be the result of many. Earthquakes, severe frosts, bursting waters, and storms tearing up the roots of trees, have, in our own times, produced them; and to this variety of causes we must, at present, be content to assign those that have happened before we had opportunities for observation.

NOTE.—*Arrangement of the Strata.*

The following succinct account of the order of succession in which the various formations noticed in previous notes occur, their mineral composition, and characteristic fossil-remains, is taken from Mr. Richardson's work entitled 'Geology for Beginners.'

I. Alluvium, modern and ancient; the term *modern* being applied to the deposites now in course of formation, or appertaining to the historic period, comprising beds of rivers, lakes, peat-bogs, coral-limestones, volcanic ejections, calcareous deposites from mineral springs, &c., containing the remains and the works of man; the latter appellation of *ancient* being usually bestowed on like accumulations formed prior to the historic era, and containing no vestiges of the human race.

THE TERTIARY FORMATIONS.

II. A vast accumulation of various deposites, marine, lacustrine, fluviatile, and volcanic, containing marine exuviæ, shells of the lake, river and land; plants and remains of mammalia of extinct and existing species.

SECONDARY FORMATIONS.

III. *The chalk, or Cretaceous Group.*—A marine series of deposites, including strata or limestone, sandstone, marl, and clay, abounding in marine organic remains, plants, corals, echinodermata, mollusca, crustacea, and fish, with turtles and reptiles.

IV. *The Wealden Formation.*—A singular and unique interpolation of fluviatile strata, among the marine formations of the secondary period, being the delta of an ancient river, and comprising beds of sandstones, limestones, and clays; containing land-plants, fresh-water mollusca, and fish; tortoises, turtles, crocodiles, and enormous reptiles, the iguanodon, hylosaurus, cetiosaurus, megalosaurus, &c., &c.

V. *The Oolite.*—A series of marine strata, of enormous extent; comprising limestones, sandstones, and clays, replete with marine mollusca, corals, shells, fish, and reptiles, terrestrial plants, and two species of mammalia, of the marsupial order.

VI. *The Lias.*—A group of marine argillaceous limestones, marls, shales, and clays, with marine mollusca, crinoidea and fishes; wood and plants, and enormous reptiles, chiefly of the genera ichthyosaurus and plesiosaurus.

VII. *The Poikilitic, or variegated, or saliferous Group.*—A marine formation, including marls, sandstones, limestones, and conglomerates frequently of red, and occasionally of variegated hues, containing gypsum and rock-salt, with corals, mollusca, plants, fish, and batrachian reptiles.

VIII. *The Carboniferous System, or coal.*—Consisting of shales, clays, ironstone, sandstone, millstone-grit, and limestone, interstratified with seams of coal, containing fresh-water, and marine mollusca and fish, and innumerable remains of terrestrial and aquatic plants of tropical types, but of extinct genera and species. The mountain limestone, with some beds of shales, sandstones, and inferior coal.

IX. *The Devonian, or old red Sandstone System.*—A marine formation; consisting of red and green marls, concretionary limestones, called cornstone, conglomerate, tilestone, micaceous, and grey sandstones, green slates, and sandstone, and blue crystalline limestone, containing corals, mollusca, and fish.

X. *The Silurian System.*—An extensive series of marine deposites; comprising limestones, sandstones, grits, flag-stones, shales, and slates, containing corals, mollusca, crustacea (trilobites), and fish.

XI. *The Cambrian System.*—A marine formation, comprising vast beds of slate rocks, with dark coloured limestones, and sandstones, containing two

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found it to consist of two compartments, the first was in shape like an oven, the other resembled the dome of a glass-house furnace. Mr. Lloyd says, from its roof were hanging stalactites, from which circumstance we may conclude, that it occurs in a limestone rock.

[13] Æliani Var. Hist. lib. xvi. cap. 16.

or three species, of corals, and of brachiopodous mollusca.

XII. *The Cumbrian System.*—A like extensive series of deposites, obviously of sedimentary origin, but in which no organic remains have been discovered.

THE PRIMARY STRATA.

XIII. *The Mica-schist.*—Composed of mica and quartz, interlaminated so as to present the appearance of stratification, but containing no organic remains.

XIV. *The Gneiss.*—Formed of the component parts of granite; mica, quartz, and feldspar, fine-grained and laminated, so as to present the appearance of having been produced by the abrasion of granite, and then deposited in water. Both the gneiss and mica-schist are conceived to have been altered by heat, subsequently to their deposition.

THE PLUTONIC, OR UNSTRATIFIED PRIMARY ROCKS.

XV. *The Granite and Trappean Rocks.*—Comprising granite, syenite, greenstone, hornblende, diallage, serpentine, &c.; together with basalt, porphyry, clinkstone, claystone, and the trap rocks, the whole being alike destitute of stratification and of organic remains.

The relative thickness of each of these several deposites has been estimated as under, but the statement must be regarded as a mere approximation, and the probability is that, with reference to the lower beds, the thickness is much greater than is here mentioned.

Tertiary system	2,000 feet.
Cretaceous	1,000
Weald	1,100
Oolite and Lias	2,500
Saliferous	2,000
Carboniferous	10,000
Old Red Sandstone	10,000
Silurian	7,500
Cambrian	20,000
Cumbrian, at least	10,000

Primary unascertained, but far exceeding that of any of the superposed deposites.

CHAP. VII.

OF CAVES AND SUBTERRANEOUS PASSAGES THAT SINK, BUT NOT PERPENDICULARLY, INTO THE EARTH.

In surveying the subterranean wonders of the globe, besides those fissures that descend perpendicularly, we frequently find others that descend but a little way, and then spread themselves often to a great extent below the surface. Many of these caverns, it must be confessed, may be the production of art and human industry; retreats made to protect the oppressed, or shelter the spoiler. The famous labyrinth of Candia, for instance, is supposed to be entirely the work of art. Mr. Tournefort assures us, that it bears the impression of human industry, and that great pains have been bestowed upon its formation. The stone-quarry of Maestricht is evidently made by labour: carts enter at its mouth, and load within, then return, and discharge their freight into boats that lie on the brink of the river Maese. This quarry is so large, that forty thousand people may take shelter in it: and it in general serves for this purpose, when armies march that way; becoming then an impregnable retreat to the people that live thereabout. Nothing can be more beautiful than this cavern, when lighted up with torches: for there are thousands of square pillars, in large level walks, about twenty feet high; and all wrought with much neatness and regularity. In this vast grotto there is very little rubbish; which shows both the goodness of the stone and the carefulness of the workmen. To add to its beauty, there also are in various parts of it, little pools of water, for the convenience of the men and cattle. It is remarkable also, that no droppings are seen to fall from the roof, nor are the walks any way wet under foot, except in cases of great rains, where the water gets in by the air-shafts. The salt-mines in Poland are still more spacious than these. Some of the catacombs, both in Egypt and Italy, are said to be very extensive. But no part of the world has a greater number of artificial caverns than Spain, which were made to serve as retreats to the Christians against the fury of the Moors, when the latter conquered that country. However, an account of the works of art does not properly belong to a natural history. It will be enough to observe, that though caverns be found in every country, far the greatest part of them have been fashioned by the hand of nature only. Their size is found beyond the power of man to have effected, and their forms but ill-adapted to the conveniences of a human habitation. In some places, indeed, we find mankind still make use of them as houses; particularly in those countries where the climate is very severe;[1] but in general they are deserted by every race of meaner animals, except the bat: these nocturnal solitary creatures are usually the only inhabitants; and these only in such whose descent is sloping, or, at least, not directly perpendicular.

There is scarcely a country in the world without its natural caverns; and many new ones are discovered every day. Of those in England, Okey-hole, the Devil's-hole, and Penpark-hole, have been often described. The former, which lies on the south side of Mendip-hills,[2] within a mile of the town of Wells, is much resorted to by travellers. To conceive a just idea of this, we must imagine a precipice of more than a hundred yards high, on the side of a mountain which shelves away a mile above it. In this is an opening not very large, into which you enter, going along upon a rocky uneven pavement, sometimes ascending, and sometimes descending. The roof of it, as you advance, grows higher; and in some places is fifty feet from the floor. In some places, however, it is so low that a man must stoop to pass. It extends itself, in length, about two hundred yards: and from every part of the roof and the floor, there are formed sparry concretions of various figures, that by strong imaginations have

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[1] Phil. Trans. vol. ii. p. 368.

[2] Ibid.

ied to men, lions, and organs. At the
art of this cavern rises a stream of wa-
tored with fish, large enough to turn
d which discharges itself near the en-

t-hole, in Gloucestershire, is almost as
e as the former. Captain Sturmy de-
ito this by a rope, twenty-five fathoms
ular, and at the bottom found a very
lt in the shape of a horseshoe. The
sisted of a kind of white stone enamel-
lead ore, and the pendant rocks were
h spar. Walking forward on this stony
for some time, he came to a great
nty fathoms broad, and eight fathoms
l having been informed that it ebbed
d with the sea, he remained in this
ode for five hours to make an exact
n. He did not find, however, any al-
hatsoever in its appearance. But his
was ill-requited; for it cost this unfor-
ntleman his life; immediately after his
was seized with an unusual and vio-
ach, which threw him into a fever, of
died soon after.[3]

ll the subterranean caverns now known,
of Antiparos is the most remarkable,
or its extent as for the beauty of its
crustations. This celebrated cavern
discovered by one Magni, an Italian
about a hundred years ago, at Antipa-
considerable island of the Archipelago.[4]
nt he gives of it is long and inflated,
e whole amusing. "Having been in-
ays he, "by the natives of Paros, that
le island of Antiparos, which lies about
from the former, of a gigantic statue
o be seen at the mouth of a cavern in
, it was resolved that we (the French
d himself) should pay it a visit. In
of this resolution, after we had land-
island, and walked about four miles
he midst of beautiful plains and sloping woodlands, we at length came to a little hill, on the side of which yawned a most horrid cavern, that with its gloom at first struck us with terror, and almost repressed curiosity. Recovering the first surprise, however, we entered boldly; and had not proceeded above twenty paces, when the supposed statue of the giant presented itself to our view. We quickly perceived, that what the ignorant natives had been terrified at as a giant was nothing more than a sparry concretion, formed by the water dropping from the roof of the cave, and by degrees hardening into a figure that their fears had formed into a monster. Incited by this extraordinary appearance, we were induced to proceed still farther, in quest of new adventures in this subterranean abode. As we proceeded, new wonders offered themselves: the spars, formed into trees and shrubs, presented a kind of petrified grove; some white, some green; and all receding in due perspective. They struck us with the more amazement, as we knew them to be mere productions of nature, who, hitherto in solitude, had, in her playful moments, dressed the scene, as if for her own amusement.

"But we had as yet seen but a few of the wonders of the place; and were introduced only into the portico of this amazing temple. In one corner of this half-illumined recess there appeared an opening of about three feet wide, which seemed to lead to a place totally dark, and that, one of the natives assured us, contained nothing more than a reservoir of water. Upon this we tried, by throwing down some stones, which rumbling along the sides of the descent for some time, the sound seemed at last quashed in a bed of water. In order, however, to be more certain, we sent in a Levantine mariner, who, by the promise of a good reward, with a flambeaux in his hand, ventured into this narrow aperture. After continuing within it for about a quarter of an hour, he returned, carrying some beautiful pieces of white spar in his hand, which art could neither imitate nor equal. Upon being informed by him that the place was full of these beautiful incrustations, I ventured in once more with him for about fifty paces, anxiously and cautiously descending by a steep and dangerous way. Finding, however, that we came to a precipice which led into a spacious amphitheatre, if I may so call it, still deeper than any other part, we returned, and being provided with a ladder, flambeaux, and other things to expedite our descent, our whole company, man by man, ventured into the same opening, and, descending one after another, we at last saw ourselves altogether in the most magnificent part of the cavern.

"Our candles being now all lighted up, and the whole place completely illuminated, never could the eye be presented with a more glittering, or a more magnificent scene. The roof all hung with solid icicles, transparent as glass, yet solid as marble. The eye could scarcely reach the lofty and noble ceiling; the sides were regu-

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averns which are so frequently found in
particularly in limestone formations, have
d by the action of water,—by earthquakes,
idden sinking of portions of the soil, or by
an fires. They either consist of a range
, or of one or more grottoes, lying behind
ach other. The depth of some caverns
00 feet; and some—such as the Nicojack
territory of the Cherokees—extend sev-
in length. Among the most remarkable
t enumerated in the present chapter are
icantara near Lisbon; those of Castleton
England, and of Fingal or Staffa in Scot-
of Sturth in Ireland; of Ombos in Egypt;
nd Puzzuolo near Naples; the caverns of
ate in Switzerland; that of the Sorcerers
ennes; of Saussenberg near Basle; the
the Dragons in Darmstadt; and the great
cave of Kentucky.—Ed.

r Mund. sub. 112. I have translated a
rcher's description, rather than Tourne-
e latter was written to support an hypo-

larly formed with spars; and the whole presented the idea of a magnificent theatre, illuminated with an immense profusion of lights. The floor consisted of solid marble; and in several places magnificent columns, thrones, altars, and other objects appeared, as if nature had designed to mock the curiosities of art. Our voices, upon speaking or singing, were redoubled to an astonishing loudness, and upon the firing of a gun, the noise and reverberations were almost deafening. In the midst of this grand amphitheatre rose a concretion of about fifteen feet high, that in some measure resembled an altar; from which, taking the hint, we caused mass to be celebrated there. The beautiful columns that shot up round the altar, appeared like candlesticks; and many other natural objects represented the customary ornaments of this sacrament.

"Below even this spacious grotto there seemed another cavern; down which I ventured with my former mariner, and descended about fifty paces by means of a rope. I at last arrived at a small spot of level ground, where the bottom appeared different from that of the amphitheatre, being composed of a soft clay yielding to the pressure, and in which I thrust a stick to about six feet deep. In this, however, as above, numbers of the most beautiful crystals were formed, one of which particularly resembled a table. Upon our egress from this amazing cavern, we perceived a Greek inscription upon a rock at the mouth, but so obliterated by time that we could not read it. It seemed to import that one Antipater, in the time of Alexander, had come thither, but whether he had penetrated into the depths of the cavern, he does not think fit to inform us."

Such is the account of this beautiful scene as communicated in a letter to Kircher. We have another, and a more copious description of it by Tournefort, which is in every body's hands; but I have given the above, both because it was communicated by the first discoverer, and because it is a simple narrative of facts, without any reasoning upon them. According to Tournefort's account, indeed, we might conclude from the rapid growth of the spars in this grotto that it must every year be growing narrower, and that it must in time be choked up with them entirely; but no such thing has happened hitherto, and the grotto at this day continues as spacious as we ever knew it.

This is not a place for an inquiry into the seeming vegetation of those stony substances, with which this and almost every cavern are incrusted; it is enough to observe, in general, that they are formed by an accumulation of that little gritty matter which is carried thither by the waters, and which in time acquires the hardness of marble. What in this place more imports us to know, is, how these amazing hollows in the earth came to be formed. And I think, in the three instances above-mentioned, it is pretty evident, that their excavation has been owing to waters. These finding subterraneous passages under the earth, and by long degrees hollowing the beds in which they flowed, the ground above them has slipt down closer to their surface, leaving the upper layers of the earth or stone still suspended: the ground that sinks upon the face of the waters forming the floor of the cavern; the ground or rock, that keeps suspended, forming the roof: and indeed there are but few of these caverns found without water, either within them, or near enough to point out their formation.

CHAP. VIII.

OF MINES, DAMPS, AND MINERAL VAPOURS.

The caverns which we have been describing, generally carry us but a very little way below the surface of the earth. Two hundred feet, at the utmost, is as much as the lowest of them is found to sink. The perpendicular fissures run much deeper; but few persons have been bold enough to venture down to their deepest recesses; and some few who have tried, have been able to bring back no tidings of the place, for unfortunately they left their lives below. The excavations of art have conducted us much farther into the bowels of the globe. Some mines in Hungary are known to be a thousand yards perpendicular downwards; and I have been informed, by good authority, of a coal-mine in the north of England, a hundred yards deeper still.[1]

It is beside our present purpose to inquire into the peculiar construction and contrivance of these, which more properly belongs to the history of fossils. It will be sufficient to observe in this place, that as we descend into the mines, the various layers of earth are seen as we have already described them; and in some of these are always found the metals or minerals for which the mine has been dug. Thus frequently gold is found dispersed and mixed with clay and gravel;[2] sometimes it is mingled with other metallic bodies, stones, or bitumens;[3] and sometimes united with that most obstinate of all substances, platina, from which scarce any art can separate it. Silver is sometimes found quite

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[1] The following is a list of some of the deepest mines at present wrought·

Kit's pühl copper-mine in the Tyrol mountains	2764 feet.
Sampson mine, at Annreasburg, in the Hartz	2230
Valenciana mine Guanaxuato, Mexico	2170
Pearce's shaft, Consolidated mines, Cornwall	1650
Monkwearmouth colliery, Durham .	1600
Wheal Abraham's mine, Cornwall .	1520
Dolcoath mine, Cornwall . .	1414
Erton mine, Staffordshire . .	1380

Ed.

[2] Ulloa, vol. ii. p. 470.

[3] Ulloa, ibid

pure,[4] sometimes mixed with other substances and minerals. Copper is found in beds mixed with various substances, marbles, sulphurs, and pyrites. Tin, the ore of which is heavier than that of any other metal, is generally found mixed with every kind of matter:[5] lead is also equally common; and iron, we well know, can be extracted from all the substances upon earth.

The variety of substances which are thus found in the bowels of the earth, in their native state, have a very different appearance from what they are afterwards taught to assume by human industry. The richest metals are very often less glittering and splendid than the most useless marcasites; and the basest ores are generally the most beautiful to the eye.

This variety of substances, which compose the internal parts of our globe, is productive of equal varieties, both above and below its surface. The combination of the different minerals with each other, the heats which arise from their mixture, the vapours they diffuse, the fires which they generate, or the colds which they sometimes produce, are all either noxious or salutary to man; so that in this great elaboratory of nature, a thousand benefits and calamities are forging, of which we are wholly unconscious; and it is happy for us that we are so.

Upon our descent into mines of considerable depth, the cold seems to increase from the mouth as we descend;[6] but after passing very low down, we begin by degrees to come into a warmer air, which sensibly grows hotter as we go deeper, till at last, the labourers can scarcely bear any covering as they continue working.

This difference in the air was supposed by Boyle to proceed from magazines of fire that lay nearer the centre, and that diffused their heat to the adjacent regions. But we now know that it may be ascribed to more obvious causes. In some mines, the composition of the earth all around is of such a nature, that upon the admission of water or air, it frequently becomes hot, and often bursts out into eruptions. Besides this, as the external air cannot readily reach the bottom, or be renewed there, an observable heat is perceived below, without the necessity of recurring to the central heat for an explanation.

Hence, therefore, there are two principal causes of the warmth at the bottom of mines: the heat of the substances of which the sides are composed; and the want of renovation in the air below.[7] Any sulphureous substance, mixed with iron, produces a very great heat, by the admission of water. If, for instance, a quantity of sulphur be mixed with a proportionable share of iron filings, and both kneaded together into a soft paste, with water, they will soon grow hot, and at last produce a flame. This experiment, produced by art, is very commonly effected within the bowels of the earth by nature. Sulphurs and irons are intimately blended together, and want only the mixture of water or air to excite their heat; and this, when once raised, is communicated to all bodies that lie within the sphere of their operation. Those beautiful minerals called *marcasites* and *pyrites*, are often of this composition; and wherever they are found, either by imbibing the moisture of the air, or having been by any means combined with water, they render the mine considerably hot.[8]

The want of fresh air also, at these depths, is, as we have said, another reason for their being found much hotter. Indeed, without the assistance of art, the bottom of most mines would, from this cause, be insupportable. To remedy this inconvenience, the miners are often obliged to sink, at some convenient distance from the mouth of the pit where they are at work, another pit, which joins the former below, and which, in Derbyshire, is called an *air-shaft*. Through this the air circulates; and thus the workmen are enabled to breathe freely at the bottom of the place; which becomes, as Mr. Boyle affirms, very commodious for respiration, and also very temperate as to heat and cold.[6] Mr. Locke, however, who has left us an account of the Mendip mines, seems to present a different picture. "The descent into these is exceedingly difficult and dangerous; for they are not sunk like wells, perpendicularly, but as the crannies of the rocks happen to run. The constant method is to swing down by a rope placed under the arms, and clamber along by applying both feet and hands to the sides of the narrow passage. The air is conveyed into them through a little passage that runs along the sides from the top, where they set up some turfs, on the lee-side of the hole, to catch and force it down. These turfs being removed to the windy side, or laid over the mouth of the hole, the miners below want breath, and faint; and if sweet-smelling flowers chance to be placed there, they immediately lose their fragrancy, and stink like carrion." An air so very putrefying can never be very commodious for respiration.

Indeed, if we examine the complexion of most miners, we shall be very well able to form a judgment of the unwholesomeness of the place where they are confined. Their pale and sallow looks show how much the air is damaged by passing through those deep and winding ways, that are rendered humid by damps, or warmed with noxious exhalations. But although every mine is unwholesome, all are not equally so. Coal-mines are generally less noxious than those of tin; tin than those of copper; but none are so dreadfully destructive as those of quicksilver. At the mines near the village of Idra, nothing can adequately describe the deplorable infirmities of such as fill the hospital there; emaciated and crippled, every limb contracted or convulsed, and some in a manner transpiring quicksilver at every pore. There was one man, says Dr. Pope,[10] who was not in the mines above half-a-year, and yet whose body was so impregnated with this mineral, that putting a piece of brass money in his mouth, or rubbing it between his fingers, it immediately became as white as if it had been washed over with quicksilver. In this manner all the workmen are killed sooner or later; first becoming paralytic, and then dying consumptive: and all this they sustain for the trifling reward of sevenpence a-day.

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[4] Macquer's Chymistry, vol. i. p. 316.

[5] Hill's Fossils, p. 628. [6] Boyle, vol. iii. p. 232.

[7] See Supplementary Note A, p. 89.

[8] Kircher Mund. Subt. vol. ii. p. 216.

[9] Boyle, vol. iii. p. 238.

But these metallic mines are not so noxious from their own vapours, as from those of the substances with which the ores are usually united, such as arsenic, cinnabar, bitumen, or vitriol. From the fumes of these, variously combined, and kept enclosed, are produced those various damps, that put on so many dreadful forms, and are usually so fatal. Sometimes those noxious vapours are perceived by the delightful fragrance of their smell,[11] somewhat resembling the pea-blossom in bloom, from whence one kind of damp has its name. The miners are not deceived, however, by its flattering appearances; but as they have thus timely notice of its coming, they avoid it while it continues, which is generally during the whole summer season. Another shows its approach by the burning of the candles, which seem to collect their flame into a globe of light, and thus gradually lessen, till they are quite extinguished. From this, also, the miners frequently escape; however, such as have the misfortune to be caught in it, either swoon away, and are suffocated, or slowly recover in excessive agonies. Here also is a third, called *the fulminating damp*, much more dangerous than either of the former, as it strikes down all before it like a flash of gunpowder, without giving any warning of its approach. But there is another, more dangerous than all the rest, which is found in those places where the vapour has been long confined, and has been, by some accident, set free. The air rushing out from thence, always goes upon deadly errands: and scarce any escape to describe the symptoms of its operations.

Some colliers in Scotland, working near an old mine that had been long closed up, happened, inadvertently, to open a hole into it, from the pit where they were then employed. By great good fortune, they at that time perceived their error, and instantly fled for their lives. The next day, however, they were resolved to renew their work in the same pit, and eight of them ventured down, without any great apprehensions; but they had scarcely got to the bottom of the stairs that led to the pit, but, coming within the vapour, they all instantly dropped down dead, as if they had been shot. Amongst these unfortunate poor men, there was one whose wife was informed that he was stifled in the mine: and, as he happened to be next the entrance, she so far ventured down as to see where he lay. As she approached the place, the sight of her husband inspired her with a desire to rescue him if possible, from that dreadful situation; though a little reflection might have shown her it was then too late. But nothing could deter her; she ventured forward, and had scarce touched him with her hand, when the damp prevailed, and the misguided, but faithful creature, fell dead by his side.

Thus, the vapours found beneath the surface of the earth are very various in their effects upon the constitution: and they are not less in their appearances. There are many kinds that seemingly are no way prejudicial to health, but in which the workmen breathe freely; and yet in these, if a lighted candle be introduced, they immediately take fire, and the whole cavern at once becomes one furnace of flame. In mines, therefore, subject to damps of this kind, they are obliged to have recourse to a very peculiar contrivance to supply sufficient light for their operations. This is by a great wheel, the circumference of which is beset with flints, which striking against steels placed for that purpose at the extremity, a stream of fire is produced, which affords light enough, and yet which does not set fire to the mineral vapour.

Of this kind are the vapours of the mines about Bristol: on the contrary, in other mines, a single spark struck out from the collision of flint and steel would set the whole shaft in a flame. In such, therefore, every precaution is used to avoid a collision; the workmen making use of wooden instruments in digging; and being cautious, before they enter the mine, to take out even the nails from their shoes. Whence this strange difference should arise, that the vapours of some mines catch fire with a spark, and others only with a flame, is a question that we must be content to leave in obscurity, till we know more of the nature both of mineral vapour and of fire. This only we may observe, that gunpowder will readily fire with a spark, but not with the flame of a candle; on the other hand, spirits of wine will flame with a candle, but not with a spark: but even here the cause of this difference as yet remains a secret.[12]

As, from this account of mines, it appears that the internal parts of the globe are filled with vapours of various kinds, it is not surprising that they should, at different times, reach the surface, and there put on various appearances. In fact, much of the salubrity, and much of the unwholesomeness, of climates and soils, is to be ascribed to these vapours, which make their way from the bowels of the earth upwards, and refresh or taint the air with their exhalations. Salt mines, being naturally cold,[13] send forth a degree of coldness to the external air, to comfort and refresh it: on the contrary, metallic mines are known not only to warm it with their exhalations, but often to destroy all kinds of vegetation by their volatile corrosive fumes. In some mines, dense vapours are plainly perceived issuing from their mouths, and sensibly warm to the touch. In some places neither snow nor ice will continue on the ground that covers a mine; and over others the fields are found destitute of verdure.[14] The inhabitants, also, are rendered dreadfully sensible of these subterraneous exhalations, being affected with such a variety of evils proceeding entirely from this cause, that books have been professedly written upon this class of disorders.

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[10] Phil. Trans. vol. ii. p. 578.

[11] Ibid. p. 375.

[12] See Supplementary Note B, p. 90.

[13] Phil. Trans. vol. ii. p. 523.

Nor are these vapours, which thus escape to the surface of the earth, entirely unconfined; for they are frequently, in a manner, circumscribed to a spot. The grotto Del Cane, near Naples, is an instance of this; the noxious effects of which have made that cavern so very famous. This grotto, which has so much employed the attention of travellers, lies within four miles of Naples, and is situated near a large lake of clear and wholesome water.[15] Nothing can exceed the beauty of the landscape which this lake affords; being surrounded with hills covered with forests of the most beautiful verdure, and the whole bearing a kind of amphitheatrical appearance. However, this region, beautiful as it appears, is almost entirely uninhabited; the few peasants that necessity compels to reside there, looking quite consumptive and ghastly, from the poisonous exhalations that rise from the earth. The famous grotto lies on the side of a hill, near which place a peasant resides, who keeps a number of dogs for the purpose of showing the experiment to the curious. These poor animals always seem perfectly sensible of the approach of a stranger, and endeavour to get out of the way. However, their attempts being perceived, they are taken and brought to the grotto; the noxious effects of which they have so frequently experienced. Upon entering this place, which is a little cave, or hole rather, dug into the hill, about eight feet high, and twelve feet long, the observer can see no visible marks of its pestilential vapour; only to about a foot from the bottom, the wall seems to be tinged with a colour resembling that which is given by stagnant waters. When the dog, this poor philosophical martyr, as some have called him, is held above this mark, he does not seem to feel the smallest inconvenience; but when his head is thrust down lower he struggles to get free for a little; but in the space of four or five minutes he seems to lose all sensation, and is taken out seemingly without life. Being plunged in the neighbouring lake, he quickly recovers, and is permitted to run home, seemingly without the smallest injury.

This vapour, which thus for a time suffocates, is of the humid kind, as it extinguishes a torch, and sullies a looking-glass; but there are other vapours perfectly inflammable, and that only require the approach of a candle to set them blazing. Of this kind was the burning well at Brosely, which is now stopped up; the vapour of which, when a candle was brought within about a foot of the surface of the water, caught flame like spirits of wine, and continued blazing several hours after. Of this kind, also, are the perpetual fires in the kingdom of Persia. In that province, where the worshippers of fire hold their chief mysteries, the whole surface of the earth, for some extent, seems impregnated with inflammable vapours. A reed stuck into the ground continues to burn like a flambeau; a hole made beneath the surface of the earth, instantly becomes a furnace, answering all the purposes of a culinary fire. There they make lime by merely burying the stones in the earth; and watch with veneration the appearances of a flame that has not been extinguished for times immemorial. How different are men in various climates! This deluded people worship these vapours as a deity, which in other parts of the world are considered as one of the greatest evils.

NOTE A.—*Internal Heat of the Globe.*

The existence of volcanoes and hot springs led philosophers long ago to suspect that there was an intense heat in the interior of the earth. The opinion of Werner, that the former arose from the combustion of masses of coal at moderate depths, was set aside by the discovery that the seat of the volcanic agents was under the primitive rocks, of course far below the coal-formation, and that the composition of lavas was the same in all parts of the world. The notion advanced by others—and favoured by Goldsmith—that hot springs might owe their origin to the accidental mixture of substances producing chemical action in the bowels of the earth, was equally inadequate to account for the permanency of these springs—their existence without any known change in temperature for ages. At length a third species of evidence presented itself in the temperature of deep mines, which it was observed was generally higher than the mean temperature of the year in the district. It was thought by some — as by our author in the above text—that the heat might arise from the breaths of the workmen, and the lights used by them. This explanation to be sure did not account for the difference of temperature said to be observed between shallow and deep mines; but the existence of the difference alluded to was doubted; and to this, as the point upon which the controversy hinged, several philosophers, especially M. Cordier, a professor of geology in Paris, directed their attention. The result is thus announced by the Parisian professor:—"1. Our experiments fully confirm the existence of a subterranean heat, which is peculiar to the terrestrial globe,—does not depend on the solar rays,—and increases rapidly with the depth. 2. The increase of the subterranean heat does not follow the same law over the whole earth; it may be twice or thrice as great in one country as in another. 3. These differences do not bear any constant proportion either to the latitude or longitude. 4. The increase is more rapid than has been supposed; it may go as high as *one* degree of Fahrenheit for 24 feet, but the mean, so far as the present observations have yet extended, cannot be fixed at less than one degree for 45 feet." In all probability, however, the increase will be found to be in a geometrical progression, as investigation is extended; in which case the crust will be found to be much thinner than it is often calculated to be. Taking as correct the present observed rate of increase, the temperature would be as follows:—Water will boil at the depth of 2,430 yards; lead melts at the depth of 8,400 yards; there is a red heat at the depth of seven miles; gold melts at twenty-one miles; cast-iron at seventy-four miles; soft-iron at ninety-seven miles; and at the depth of one hundred miles there is a temperature equal to the greatest artificial heat yet observed, a temperature capable of fusing platina, porcelain, and indeed every refractory substance we are acquainted with. These temperatures are calculated from Guyton Morveau's corrected scale of Wedgewood's pyrometer, and if we adopt them, we find that the earth is fluid at the depth of 100 miles from the surface, and that, even in its present state, very little more than the soil on which we tread is fit for the habitation of organized beings. Cordier, therefore, considers the whole globe as a mass of fused matter intensely hot, covered with a solid crust or shell whose thickness is about one 63d part of its semidiameter, and upon which crust man and all his works are suspended over the molten abyss.

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[14] Boyle, vol. iii. p. 238.

[15] Kircher, Mund. Subt. vol. i. p. 191.

NOTE B.—*Gases in Mines—The Safety Lamp.*

The coal-mines of Great Britain were wrought on a very limited scale, and with comparatively little system, till after the beginning of the eighteenth century. It was not till the introduction of the steam-engine, for drawing water in the first place, and coals afterwards, that the coal-mines began to be wrought on an extensive scale; even to this period the ventilation of mines was conducted in a very rude, uncertain, and irregular manner, and for many years afterwards. Every bed of coal abounds less or more with deleterious air, which is of two kinds; the one is specifically heavier, the other lighter, than common air; the natural consequence of which is, that the one rests in the deepest or lowest places, the other, from its levity, ascends to the highest places of the mine. The first is known by the common provincial names of choke damp, black damp, styth, or bad air; the other is known by the name of foul air, fire damp, or inflammable air. The one is the carbonic acid, the other the carburetted hydrogen gas of the chemist. The precise qualities of the carbonic acid of coal-mines have been comparatively little attended to, as its destroying powers have not operated extensively. The nature and composition of the carburetted hydrogen have closely engaged the attention of philosophers for the last ten years. According to the best authorities these gases are of the following specific gravity and weight:

	Spec. Grav.	Weight of 100 Cubic inches.
Carbonic acid .	1.518	46.313
Carburetted hydrogen	0.555	16.99
Hydrogen . .	0.074	2.230

the common air being reckoned unity, the temperature at 60, and barometer at 30 inches. According to Dr. Thomson, the component parts of carburetted hydrogen are,

Carbon . . .	72
Hydrogen .	28
	100

in which there is always a mixture of carbonic acid.

Various theories have been brought forward regarding the formation of these gases, but more particularly of the carburetted hydrogen: both of them flow or exude from the cutters, fissures, and minute pores of the coal; and when in small quantity in the forehead of a mine in solid coal, they make a hissing noise. The carbonic acid seldom comes off very suddenly in large quantities. From its weight it is not liable to a sudden change of place, and though it is invisible, its line of division from the common atmospheric air is most distinctly found by approaching it with a lighted candle or lamp; for though the candle burns with its ordinary brightness at the distance of three inches from the carbonic acid, the instant it is placed within this air, it is suddenly extinguished: it produces the same instant effect upon the strongest flame of coals; sometimes the upper part of the mine next the roof has the air perfectly good, while the pavement has a stratum of carbonic acid, of a foot or two in thickness, resting upon it.

As the flame of a candle is a correct index of the presence of this air, the miners have instant warning, and stop their advancing any farther, till means are used to drive it away. Comparatively few lives have been lost by this gas. Those who have perished from its effects, had generally gone amongst it without a candle, and of course were insensible of its presence, till they dropped down from its deleterious effects on the constitution. When men are rendered senseless by inhaling this air, they can be recovered if brought quickly into good air, but if they remain any time in it, all attempts to recover them are ineffectual. It must be remarked, however, that as the air of these coal-mines which abound with carbonic acid, has always a very considerable mixture of it through the whole of the works, the air in this state is reckoned very salubrious, though mixed with a great proportion of moisture. The workmen who breathe it every day are generally healthy, and it is reckoned a specific in some complaints, it being a common practice to send down children affected with the hooping cough to breathe in it.

The carburetted hydrogen is not found in all coal-mines, and is seldom seen where the carbonic acid abounds. In Scotland there are extensive districts where the inflammable air was never seen, and others where it is very abundant. In the numerous collieries situated upon the north banks of the river Forth, it is only found in one very limited district, and in only two districts upon the south banks of the Forth. In the very extensive coal-fields in the Lothians, south from the city of Edinburgh, it is unknown: whereas in the coal-fields around the city of Glasgow, and along the coast of Ayr, it is found very abundant; at the same time there are coal-fields in that very extensive range, where it never was seen; but where it is not seen, the carbonic acid abounds.

The production of these gases renders the system of the ventilation of coal-mines a chief point in the system of mining, particularly where the inflammable air abounds, by which the lives of the workmen and the prosperity of the mining concern may be instantly destroyed. It would require a long dissertation, and the most minute detail, to give a clear view of the almost infinite variety of cases connected with the accumulation of inflammable air in the mines of a colliery, and of the plans and methods which have to be employed and varied for the ventilation, corresponding to each particular situation of the mines. With daily misfortunes of a lesser or greater degree were the collieries of Great Britain carried on from year to year, every one struggling against the direful ravages of the inflammable air: but it baffled the skill of the most experienced engineers, and all the precautions of their most unwearied diligence and anxious attention. The general question and anxious inquiries were, Can no remedy be devised to avert these awful calamities, to deliver an industrious class of society from such desolating catastrophes? Many plans were proposed, but they were altogether inapplicable.

In some instances, fish, which, in the incipient stage of putrefaction, give a strong phosphoric light, had been tried to give light to the miner in very dangerous cases; and the light produced by the collision of flint and steel was universally employed when candles could not be used without producing an explosion. The machine for producing this light is named a steel mill. Philosophers proposed the various kinds of phosphorus, but these were altogether insufficient for the purpose. When tried in the mines they only produced a most melancholy light, and rather tended to render "the darkness visible." In the meantime the mines were extended, and the melancholy catastrophes constantly increased. At last an explosion and catastrophe took place at Felling colliery, near Gateshead, in the county of Durham, about a mile and a half distant from Newcastle, more dreadful and melancholy in their consequence than any which had ever taken place in the collieries of Great Britain. This colliery was working with great vigour and under a most regular system both as to the mining operations and ventilation; the latter was effected by a furnace and air-tube placed upon a rise-pit on elevated ground south from the turnpike road leading to Sunderland. The depth of the winning was above 100 fathoms; twenty-five acres of coal had been excavated, and such was the execution of work, that from one pit they were drawing at the rate of 1,700 tons of coal weekly. Upon the 25th May, 1812, the night-shift was relieved by the day-shift of miners at eleven o'clock forenoon, one hundred and twenty-one persons were in the mine, and had taken their several places, when at half-past eleven o'clock the gas fired, and produced a most tremendous explosion, which alarmed all the neighbouring villages. The subterraneous fire broke forth with two heavy descharges from the dip-pit, and these were instantly followed by one from the rise-pit. A slight trembling, as from an earthquake, was felt for about half-a-mile around the colliery, and the noise of the explosion, though dull, was heard at from three to four miles distance. Immense quantities of dust and small coal accompanied these blasts, and rose high into the air, in the form of an inverted cone. The heaviest part of the ejected matter, such as corves, wood, and small coal, fell near the pits, but the dust, borne away by a strong west wind, fell in a continued shower to the distance of a mile and a half from the pit. In the adjoining village of Heworth it caused a darkness like that of early twilight, and covered the roads so thickly, that the footsteps of passengers were imprinted in it. The heads of both shaft-frames were blown off, their sides set on fire, and their pulleys shattered in pieces. The coal dust ejected from the rise-pit into the horizontal part of the ventilating tube was about three inches thick, and soon burnt to a cinder; pieces of burning coal driven off the solid stratum of the mine were also blown up this shaft. Of the 121 persons in the mine, at the time of the explosion, only 32 were drawn up the pit alive; and of these, three died within a few hours after the accident. Thus were no less than 92 persons killed in an instant by this desolating pestilence. The scene at the pit-mouth cannot be described. This fatal misfortune at Felling roused the minds of every one connected with coal-mines, in order to find, if possible, a remedy for preventing such catastrophes.

Dr. William Reid Clanny, of Sunderland, had, in the year 1813, turned his attention to the construction of a lamp which would burn amongst inflammable air, and, though an explosion might take place in the lamp, would not communicate flame to the external surrounding air. This he accomplished by means of an air-tight lamp with a glass front, the flame of which was supported by blowing air from a pair of small bellows through a stratum of water in the bottom of the lamp, while the heated air passed through water by a recurved tube at the top. By this process, the air within the lamp was completely insulated from the external air, and it appears that this was the first lamp that ever was taken into a body of inflammable air in a coal-mine at the exploding point, without producing an explosion of the surrounding gas. Dr. Clanny made another lamp upon an improved plan, by introducing into it the steam of water produced from a small vessel at the top of the lamp, heated by the flame. For these inventions the Doctor twice received the thanks of "The Society for preventing accidents in Coal-Mines;" and he also received the silver and afterwards the gold medal from the Society of Arts in London. Although these lamps, invented by Dr. Clanny, were upon philosophical principles, displayed much ingenuity, and were absolutely safety-lamps for mines, yet their construction prevented them from being generally used. It appears that nothing further was attempted in this important matter, until the accident at Felling colliery, as before noticed, when Sir Humphrey Davy, Mr. James Stevenson, engineer, Killingworth colliery, Newcastle, and Dr. John Murray of Edinburgh, brought forward safety-lamps, in the year 1816, each constructed upon different principles. Sir Humphrey Davy's lamp was made of fine iron wire gauze, without any glass; that of Mr. Stevenson was made of a strong glass cylinder having a metal plate at top, and another at bottom, perforated with very small holes to permit the air to pass to and from the lamp; and that of Dr. Murray was a glass lamp, or rather lanthorn, to which good atmospheric air was brought by means of a long leather pipe from the air-course. Of these Dr. Murray's lamp was not applicable but in a very few cases; the lamps of Sir Humphrey Davy and Mr. Stevenson were both complete safety-lamps in their principle, and are applied in practice; but that of Sir Humphrey Davy is decidedly the best, and is generally used in Great Britain. Having no glass it is not easily injured, and sufficient light for the miner passes through the wire gauze. To each of these gentlemen the world is highly indebted, and in particular the mining interest of Great Britain for their individual exertions. The safety-lamp of Sir Humphrey Davy was instantly tried, and approved of by Mr. Buddle, and the principal mining engineers at Newcastle. No one was more zealous to prove its safety and introduce it into the mines, than the Rev. John Hodgson, of Heworth. He descended the mines, entered amongst the inflammable air, and fully satisfied himself of its absolute safety, in order that he might induce the miners of his parish to use it, half of whom he had seen so lately swept away by the dreadful explosion before narrated.

The invention of this lamp has produced a new era in the coal-mining of Great Britain. The steel mills were very expensive, and in certain cases produced explosions, whereas the safety-lamp can be carried without danger amongst inflammable gas ready to explode: and although the wire become red-hot, an explosion of the gas will take place inside of the lamp, without communicating inflammation to the external gas.

CHAP. IX.

OF VOLCANOES AND EARTHQUAKES.

MINES and caverns, as we have said, reach but a very little way under the surface of the earth, and we have hitherto had no opportunities of exploring further. Without all doubt the wonders that are still unknown surpass those that have been represented, as there are depths of thousands of miles which are hidden from our inquiry. The only tidings we have from those unfathomable regions are by means of volcanoes, those burning mountains that seem to discharge their materials from the lowest abysses of the earth.[1] A volcano may be considered as a cannon of immense size, the mouth of which is often near two miles in circumference. From this dreadful aperture are discharged torrents of flame and sulphur, and rivers of melted metal. Whole clouds of smoke and ashes, with rocks of enormous size, are discharged to many miles' distance; so that the force of the most powerful artillery is but as a breeze agitating a feather in comparison. In the deluge of fire and melted matter which runs down the sides of the mountain, whole cities are sometimes swallowed up and consumed. Those rivers of liquid fire are often two hundred feet deep; and when they harden, frequently form considerable hills. Nor is the danger of these confined to the eruption only: but the force of the internal fire struggling for vent, frequently produces earthquakes through the whole region where the volcano is situated. So dreadful have been these appearances, that men's terrors have added new horrors to the scene, and they have regarded as prodigies what we know to be the result of natural causes. Some philosophers have considered them as vents communicating with the fires of the centre; and the ignorant as the mouths of hell itself. Astonishment produces fear, and fear superstition: the inhabitants of Iceland believe the bellowings of Hecla are nothing else but the cries of the damned, and that its eruptions are contrived to increase their tortures.

But if we regard this astonishing scene of terror with a more tranquil and inquisitive eye, we shall find that these conflagrations are produced by very obvious and natural causes. We have already been apprized of the various mineral substances in the bosom of the earth, and their aptness to burst out into flames. Marcasites and pyrites, in particular, by being humified with water or air, contract this heat, and often endeavour to expand with irresistible explosion. These, therefore, being lodged in the depths of the earth, or in the bosom of mountains, and being either washed by the accidental influx of waters below, or fanned by air, insinuating itself through perpendicular fissures from above, take fire at first by only heaving in earthquakes, but at length by bursting through every obstacle, and making their dreadful discharge in a volcano.[2]

These volcanoes are found in all parts of the earth.[3] In Europe there are three that are very remarkable; Ætna in Sicily, Vesuvius in Italy, and Hecla in Iceland. Ætna has been a volcano for ages immemorial. Its eruptions are very violent, and its discharge has been known to cover, for a certain space around, sixty-eight feet deep. In the year 1537, an eruption of this mountain produced an earthquake through the whole island for twelve days, overturned many houses, and at last formed a new aperture, which overwhelmed all within five leagues round. The cinders thrown up were driven even into Italy, and its burnings were seen at Malta, at the distance of sixty leagues. "There is nothing more awful," says Kircher, "than the eruptions of this mountain, nor nothing more dangerous than attempting to examine its appearances, even long after the eruption has ceased. As we attempt to clamber up its steepy sides, every step we take upwards, the feet sink back half-way. Upon arriving near the summit, ashes and snow, with an ill-assorted conjunction, present nothing but objects of desolation. Nor is this the worst; for, as all places are covered over, many caverns are entirely hidden from the sight, into which, if the inquirer happens to fall, he sinks to the bottom, and meets inevitable destruction. Upon coming to the edge of the great crater, nothing can sufficiently represent the tremendous magnificence of the scene. A gulf two miles over, and so deep that no bottom can be seen; on the sides pyramidical rocks starting out between apertures that emit smoke and flame; all this accompanied with a sound that never ceases, louder than thunder, strikes the bold with horror, and the religious with veneration for Him that has power to control its burnings."

In the descriptions of Vesuvius or Hecla, we shall find scarcely anything but a repetition of the same terrible objects, but rather lessened, as these mountains are not so large as the former. The crater of Vesuvius is but a mile across, according to the same author, whereas that of Ætna is two. On this particular, however, we must place no dependence, as these caverns every day alter; being lessened by the mountain's sinking in at one eruption, and enlarged by the fury of another. It is not one of the least remarkable particulars respecting Vesuvius, that Pliny the naturalist was suffocated in one of its eruptions; for his curiosity impelling him too near, he found himself involved in smoke and cinders when it was too late to retire; and his companions hardly escaped to give an account of the misfortune. It was in that dreadful eruption that the city of Herculaneum was overwhelmed; the ruins of which have been lately discovered at sixty feet distance below the surface, and, what is still more remarkable, forty feet below the bed of the sea.[4] One of the most remarkable eruptions of this mountain was in the year 1707, which is finely described by Valetta; a part of whose description I shall beg leave to translate.

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[1] Buffon, vol. i. p. 291.

[2] See Supplementary Note A, p. 89.

[3] See Supplementary Note A, p. 95.

[4] See Supplementary Note B, p. 96.

"Towards the latter end of summer, in the year 1707, the mount Vesuvius, that had for a long time been silent, now began to give some signs of commotion. Little more than internal murmurs at first were heard, that seemed to contend within the lowest depths of the mountain; no flame, nor even any smoke, was as yet seen. Soon after some smoke appeared by day, and a flame by night, which seemed to brighten all the campania. At intervals, also, it shot off substances with a sound very like that of artillery, but which, even at so great a distance as we were at, infinitely exceeded them in greatness. Soon after, it began to throw up ashes, which, becoming the sport of the winds, fell at great distances, and some many miles. To this succeeded showers of stones, which killed many of the inhabitants of the valley, but made a dreadful ravage among the cattle. Soon after, a torrent of burning matter began to roll down the sides of the mountain, at first with a slow and gentle motion, but soon with increased celerity. The matter thus poured out, when cool, seemed upon inspection to be of vitrified earth, the whole united into a mass of more than stony hardness. But what was particularly observable was, that upon the whole surface of these melted materials a light spongy stone seemed to float, while the lower body was of the hardest substance of which our roads are usually made. Hitherto there were no appearances but what had been often remarked before; but on the third or fourth day, seeming flashes of lightning were shot forth from the mouth of the mountain, with a noise far exceeding the loudest thunder. These flashes, in colour and brightness, resembled what we usually see in tempests, but they assumed a more twisted and serpentine form. After this followed such clouds of smoke and ashes, that the whole city of Naples, in the midst of the day, was involved in nocturnal darkness, and the nearest friends were unable to distinguish each other in this frightful gloom. If any person attempted to stir out without torch-light, he was obliged to return, and every part of the city was filled with supplications and terror. At length, after a continuance of some hours, about one o'clock at midnight, the wind blowing from the north, the stars began to be seen; the heavens, though it was night, began to grow brighter; and the eruptions, after a continuance of fifteen days, to lessen. The torrent of melted matter was seen to extend from the mountain down to the shore; the people began to return to their former dwellings, and the whole face of nature to resume its former appearance."

Bishop Berkeley gives an account of one of these eruptions in a manner something different from the former.[5] "In the year 1717, and in the middle of April, with much difficulty I reached the top of Mount Vesuvius, in which I saw a vast aperture full of smoke, which hindered me from seeing its depth and figure. I heard within that horrid gulf certain extraordinary sounds, which seemed to proceed from the bowels of the mountain, a sort of murmuring, sighing, dashing sound; and between whiles, a noise like that of thunder or cannon, with a clattering like that of tiles falling from the tops of houses into the streets. Sometimes, as the wind changed, the smoke grew thinner, discovering a very ruddy flame, and the circumference of the crater streaked with red and several shades of yellow. After an hour's stay, the smoke, being moved by the wind, gave us short and partial prospects of the great hollow; in the flat bottom of which I could discern two furnaces almost contiguous; that on the left seeming about three yards over, glowing with ruddy flame, and throwing up red-hot stones with a hideous noise, which, as they fell back, caused the clattering already taken notice of.—May 8, in the morning, I ascended the top of Vesuvius a second time, and found a different face of things. The smoke ascending upright, gave a full prospect of the crater, which, as I could judge, was about a mile in circumference, and a hundred yards deep. A conical mount had been formed, since my last visit, in the middle of the bottom, which I could see was made by the stones, thrown up and fallen back again into the crater. In this new hill remained the two furnaces already mentioned. The one was seen to throw up every three or four minutes, with a dreadful sound, a vast number of red-hot stones, at least three hundred feet higher than my head, as I stood upon the brink; but as there was no wind, they fell perpendicularly back from whence they had been discharged. The other was filled with red-hot liquid matter, like that in the furnace of a glass-house, raging and working like the waves of the sea, with a short abrupt noise. This matter would sometimes boil over, and run down the side of the conical hill, appearing at first red-hot, but changing colour as it hardened and cooled. Had the wind driven in our faces, we had been in no small danger of stifling by the sulphureous smoke, or being killed by the masses of melted minerals that were shot from the bottom. But as the wind was favourable, I had an opportunity of surveying this amazing scene for above an hour and a half together. On the fifth of June, after a horrid noise, the mountain was seen at Naples to work over; and, about three days after, its thunders were renewed so, that not only the windows in the city, but all the houses, shook. From that time it continued to overflow, and sometimes at night were seen columns of fire shooting upward from its summit. On the tenth, when all was thought to be over, the mountain again renewed its terrors, roaring and raging most violently. One cannot form a juster idea of the noise, in the most violent fits of it, than by imagining a mixed sound made up of the raging of a tempest, the murmur of a troubled sea, and the roaring of thunder and artillery, confused all together. Though we heard this at a distance of twelve miles, yet it was very terrible. I therefore resolved to approach nearer to the mountain; and, accordingly, three or four of us got into a boat, and were set ashore at a little town situated at the foot of the mountain. From thence we rode about four or five miles, before we came to the torrent of fire that was descending from the side of the volcano; and here the roaring grew exceedingly loud and terrible as we approached. I observed a mixture of colours in the cloud, above the crater, green, yellow, red, and blue. There was likewise a ruddy dismal light in the air, over that tract where the burning river flowed. These circumstances, set off and augmented by the horror of the night, made a scene the most uncommon and astonishing I ever saw; which still increased as we approached the burning river. Imagine a vast torrent of liquid fire, rolling from the top down the side of the mountain, and with irresistible fury bearing down and consuming vines, olives, and houses; and divided into different channels, according to the inequalities of the mountain. The largest stream seemed half a mile broad at least, and five miles long. I walked so far before my companions up the mountain, along the side of the river of fire, that I was obliged to retire in great haste, the sulphureous steam having surprised me, and almost taken away my breath. During our return, which was about three o'clock in the morning, the roaring of the mountain was heard all the way, while we observed it throwing up huge spouts of fire and burning stones, which, falling, resembled the stars in a rocket. Sometimes I observed two or three distinct columns of flame, and sometimes one only, that was large enough to fill the whole crater. These burning columns, and fiery stones, seemed to be shot a thousand feet perpendicular above the summit of the volcano; and in this manner the mountain continued raging for six or eight days after. On the 18th of the same month, the whole appearance ended, and the mountain remained perfectly quiet, without any visible smoke or flame."

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[5] Phil Trans. vol. ii. p. 209.

The matter which is found to roll down from the mouth of all volcanoes, in general resembles the dross that is thrown from a smith's forge. But it is different, perhaps, in various parts of the globe; for, as we have already said, there is not a quarter of the world that has not its volcanoes.[6] In Asia, particularly in the islands of the Indian ocean, there are many. One of the most famous is that of Albouras, near mount Taurus, the summit of which is continually on fire, and covers the whole adjacent country with ashes. In the island of Ternate there is a volcano which, some travellers assert, burns most furiously in the times of the equinoxes, because of the winds which then contribute to increase the flames. In the Molucco islands, there are many burning mountains; they are also seen in Japan, and the islands adjacent; and in Java and Sumatra, as well as in other of the Philippine islands. In Africa there is a cavern, near Fez, which continually sends forth either smoke or flames. In the Cape de Verde islands, one of them, called the Island del Fuego, continually burns; and the Portuguese, who frequently attempted a settlement there, have as often been obliged to desist. The Peak of Teneriffe is, as everybody knows, a volcano that seldom desists from eruptions. But of all parts of the earth, America is the place where those dreadful irregularities of nature are the most conspicuous. Vesuvius, and Ætna itself, are but mere fire-works in comparison to the burning mountains of the Andes; which, as they are the highest mountains of the world, so also are they the most formidable for their eruptions. The mountain of Arequipa, in Peru, is one of the most celebrated; Carassa and Malahallo are very considerable; but that of Cotopaxi, in the province of Quito, exceeds anything we have hitherto read or heard of. The mountain of Cotopaxi, as described by Ulloa,[7] is more than three miles perpendicular from the sea; and it became a volcano at the time of the Spaniards' first arrival in that country. A new eruption of it happened in the year 1743, having been some days preceded by a continual roaring in its bowels. The sound of one of these mountains is not, like that of the volcanoes in Europe, confined to a province, but is heard at a hundred and fifty miles' distance.[8] "An aperture was made in the summit of this immense mountain; and three more about equal heights near the middle of its declivity, which was at that time buried under prodigious masses of snow. The ignited substances ejected on that occasion, mixed with a prodigious quantity of ice and snow, melting amidst the flames, were carried down with such astonishing rapidity, that in an instant the valley from Callo to Latacunga was overflowed; and besides its ravages in bearing down the houses of the Indians, and other poor inhabitants, great numbers of people lost their lives. The river of Latacunga was the channel of this terrible flood; till being too small for receiving such a prodigious current, it overflowed the adjacent country, like a vast lake, near the town, and carried away all the buildings within its reach. The inhabitants retired into a spot of higher ground behind the town, of which those parts which stood within the limits of the current were totally destroyed. The dread of still greater devastations did not subside for three days; during which the volcano ejected cinders, while torrents of melted ice and snow poured down its sides. The eruption lasted several days, and was accompanied with terrible roarings of the wind, rushing through the volcano, still louder than the former rumblings in its bowels. At last all was quiet, neither fire nor smoke to be seen, nor noise to be heard; till in the ensuing year, the flames again appeared with recruited violence, forcing their passage through several other parts of the mountain, so that in clear nights the flames being reflected by the transparent ice, formed an awfully magnificent illumination."

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[6] See Supplementary Note C, p. 96.

[7] Ulloa, vol. i. p. 442.

[8] Ibid.

Such is the appearance and the effect of those fires which proceed from the more inward recesses of the earth: for that they generally come from deeper regions than man has hitherto explored, I cannot avoid thinking, contrary to the opinion of Mr. Buffon, who supposes them rooted but a very little way below the bed of the mountain. "We can never suppose," says this great naturalist, "that these substances are ejected from any great distance below, if we only consider the great force already required to fling them up to such vast heights above the mouth of the mountain; if we consider the substances thrown up, which we shall find upon inspection to be the same with those of the mountain below; if we take into our consideration, that air is always necessary to keep up the flame; but most of all, if we attend to one circumstance, which is, that if these substances were exploded from a vast depth below, the same force required to shoot them up so high, would act against the sides of the volcano, and tear the whole mountain in pieces." To all this specious reasoning, particular answers might easily be given; as, that the length of the funnel increases the force of the explosion; that the sides of the funnel are actually often burst with the great violence of the flame; that air may be supposed at depths at least as far as the perpendicular fissures descend. But the best answer is a well known fact; namely, that the quantity of matter discharged from Ætna alone is supposed, upon a moderate computation, to exceed twenty times the original bulk of the mountain.[9] The greatest part of Sicily seems covered with its eruptions. The inhabitants of Catanea have found, at the distance of several miles, streets and houses sixty feet deep, overwhelmed by the lava or matter it has discharged. But what is more remarkable, the walls of these very houses have been built of materials evidently thrown up by the mountain. The inference from all this is very obvious; that the matter thus exploded cannot belong to the mountain itself, otherwise it would have been quickly consumed; it cannot be derived from moderate depths, since its amazing quantity evinces, that all the places near the bottom must have long since been exhausted; nor can it have an extensive, and, if I may so call it, a superficial spread, for then the country round would be quickly undermined; it must, therefore, be supplied from the deeper regions of the earth; those undiscovered tracts where the Deity performs his wonders in solitude, satisfied with self-approbation!

NOTE A.—*Volcanoes.*

A great chain of ignivomous mountains stretches around the great ocean. Terra del Fuego, Chili, Peru, all the chain of the Andes, are full of volcanoes. We distinguish in Peru, those of Arequipa and of Pitchinca; and that of Cotopaxi, whose flames in 1738 rose higher than 2,000 feet, and whose explosion was heard at the distance of 120 leagues, if we may give credit to the Spaniards. Chimboraço, the highest mountain of the globe, is an extinguished volcano; and there are a great many others. Humboldt has seen the smoke of Antisana rise 18,000 feet. If we pass the isthmus of Panama, we find the volcanoes of Nicaragua and of Guatimala. Their number is infinite: there are some which are covered with perpetual snow, and which consequently are elevated to a great height. Then come those of Mexico, properly so called; namely, Orizaba, Popocateipetl, 16,626 feet high; Jorullo, which first broke out in 1759, and several others, all situate under the 19th parallel of latitude. California contains five volcanoes, that are now burning. There can be no doubt, according to the accounts of Cook, la Perouse, and Malaspina, that there is a number of very considerable volcanoes on the north-west of America. Mount Saint Elie is nearly 16,800 in height; these volcanoes form the intermediate link between those of Mexico and those in the Aleutian islands, and the peninsula of Alaschka. These last, which are very numerous, both extinct and burning, serve to continue the chain towards Kamschatka, where there are three of great violence. Japan has eight; and the island of Formoso has several. The volcanic belt now becomes immensely wide, and embraces the Philippine islands, the Marian or Ladrones, the Moluccas, Java, Sumatra, the isles of Queen Charlotte, the New Hebrides, and, in short, all that vast archipelago which forms the fifth part of the globe. The other volcanic chains are far from being of so great extent. There is perhaps one in the Indian sea. The islands of Saint Paul and Amsterdam, the formidable volcano in the island of Bourbon, and the jets of hot water in the island of Madagascar, are the only known links of this chain. The gulf of Arabia flows at the base of the volcano of Gebel-Tar. The neighbourhood of the Dead sea, and the whole chain of mountains which runs through Syria, have been the theatre of volcanic eruptions. We may be allowed to connect these two facts. A vast volcanic zone surrounds Greece, Italy, Germany, and France. The celebrated revolutions of the Grecian archipelago, and those new islands produced by sub-marine explosions, are well known. The summits of Mount Ætna are next descried; this mountain has burnt for 3,300 years, and it is surrounded by extinguished volcanoes which appear much more ancient. The islands of Lipari seem to owe their origin to the volcanoes which they contain. Vesuvius has not always been the only ignivomous mountain in the kingdom of Naples; another still larger, but extinguished, has been discovered near Rocca Fina. The Solfatara is ranked under the same class. The Ponce islands, or islands of Ponza, are of volcanic origin; the catacombs of Rome are excavations from the lava. Tuscany abounds in hot and sulphureous springs, and other indications of volcanoes. Arduini observed in the environs of Padua, Verona, and Vicenza, a great number of extinguished volcanoes. Dalmatia has several. It was long suspected that a district in Hungary nourished subterraneous fires in its bosom; the eruption of a volcano has recently evinced the truth of the conjecture. Germany contains a great number of extinguished volcanoes; the best known of which are those of Kamberg in Bohemia, Transberg near Gottingen, and those near Bonn and Andernach, upon the borders of the Rhine. The southern part of France is full of extinguished volcanoes, amongst which Mount Cantal, the Puy-de-Dome, and Mount d'Or in Auvergne, are the most conspicuous. The western is not like the Great Ocean, encircled by a chain of ignivomous mountains, but it contains in its bosom several groupes. If the principality of Wales, the island of Staffa, and some parts of Scotland and Ireland, exhibit only equivocal proofs of the existence of extinguished volcanoes, Iceland presents to our view its Hecla, its Kotlouguia, and several other volcanoes, which rise from the midst of perpetual snow. This volcanic focus is one of the most active in the globe; the very bottom of the ocean is, in these regions, agitated, and the waves often heave up whole fields of pumice-stone, or with convulsive throes give birth to permanently new islands. Several circumstances lead us to suppose, that there are some volcanoes in the interior of Greenland. That frozen country experiences the shocks of earthquakes. The middle of the Atlantic ocean conceals another volcanic focus, of which the Azores and Canary islands have felt the effects. The Peak of Teneriffe, which is 11,400 feet, is the most elevated volcano in the old world. It is very probable that Lisbon has in its vicinity a submarine volcano. The Antilles probably contain a whole system of volcanoes, parts of which are recognised in Jamaica, Guadaloupe, and Grenada. We may also mention some volcanoes, which are detached, or which belong to groupes little known. Such are Mount Elburtz in Persia, the extinguished volcanoes of Daourie, discovered by Patrin; perhaps some volcanoes to the north of China. That which is seen in Fuego, one of the Cape Verde islands, and those which the Portuguese authors point out in Guinea, Congo, and Monomotapa.

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[9] Kircher, Mund. Subt. vol. i. p. 202.

Note B.—*Vesuvius.*

"While contemplating Vesuvius, it is natural to dwell upon the volcano, its nature, depth, and extent, and to inquire whether it is not connected with Stromboli and Ætna, and whether this grand bed of fire does not extend throughout Italy, which everywhere bears evidence of former volcanoes and of present subterranean fires. However this may be, it appears that it may be said with considerable confidence, that at least fifteen or twenty miles on each side will not more than include this burning furnace. Twelve miles from Vesuvius, beyond Naples, are the vapour baths of San Germano. An old stone building covers a spot of earth, whence issues this heated vapour. There is but a slight smell of sulphur, but the heat throws one immediately into a profuse perspiration. The walls on the inside are covered with an incrustation of alum, from half to two inches thick. Here, then, is sufficient evidence of subterranean fires. A short distance from these baths is the Grotto del Cane, a small partly artificial cave, but twelve or fifteen feet deep and six high, in the side of a hill of Tufa. It is noted for the carbonic acid it contains. The smoke of a taper settling upon it, ran out of the entrance like a liquid; thus showing that there is an incessant fountain of the gas. I stepped in, and besides the increased pressure perceived also an increase of heat. This heat and the continual reproduction of the gas, seem sufficient to prove its igneous origin. This cave and the bath are situated on the borders of a small lake, (Lago d'Agnano,) which from its circular form, great depth, (500 feet,) and the volcanic nature of the surrounding country, is supposed to be an ancient crater. A mile from the lake is the famous Solfatara, a volcano not long since in action, abounding in sulphur, alum, and other volcanic productions. Near by is a rivulet of boiling water. Not far distant is the crater of another extinct volcano, (Astroni,) four miles in circumference; and just north of the bay of Baia is another hot spring. Nine miles west of Naples is the island of Procida, with a volcanic soil; fifteen miles is Ischia, whose extinct volcano, currents of lava, (once the destruction of its town,) and hot springs, are sufficient to prove its volcanic origin. South of these, the plain of Sorrento bears evidence of a former volcano. Thus, Vesuvius is nearly surrounded with volcanoes, now apparently extinct, but whose fires, as is proved by the hot springs and vapour baths, yet burn. A mountain which has ejected such immense quantities of lava as has Vesuvius, must necessarily have a great extent of volcanic fires. If, as says Braccini—and from experiment—the descent to the internal plain in 1631 was by a rapid declivity of three miles, and consequently its situation far below the level of the sea, what limits ought to be assigned to the fires, which, as they were then latent, must have been far below the plain he reached? It will not therefore require much credulity to believe a radius of six or eight miles necessary to include the fires of Vesuvius, even supposing that there are no others in the neighbourhood. But others do exist, and judging of their probable limits by the size of the old crater, is there not reason to believe that they also extend six or eight miles, and thus meet those of Vesuvius; or rather, that there is but one great source, or furnace, of which Vesuvius is the present spiracle!"—*Communicated from* **J. D. Dana** *to Professor Silliman, July* 12*th*, 1834.

Note C.—*Volcano of Kirauea.*

Various burning chasms and volcanoes are to be seen in the Sandwich Islands. Mr. Ellis, in his Missionary Tour, thus describes a great volcano in Hawaii or Owyhee, which he visited: "About two P. M. the crater of Kirauea suddenly burst upon our view. We expected to have seen a mountain with a broad base and rough indented sides, composed of loose slags or hardened streams of lava, and whose summit would have presented a rugged wall of scoria, forming the rim of a mighty caldron. But instead of this, we found ourselves on the edge of a steep precipice, with a vast plain before us, fifteen or sixteen miles in circumference, and sunk from 200 to 400 feet below its original level. The surface of this plain was uneven, and strewed over with large stones and volcanic rocks, and in the centre of it was the great crater, at the distance of a mile and a half from the precipice on which we were standing. Our guides led us round towards the north end of the ridge, in order to find a place by which we might descend to the plain below. We walked on to the north end of the ridge, where, the precipice being less steep, a descent to the plain below seemed practicable. It required, however, the greatest caution, as the stones and fragments of rock frequently gave way under our feet, and rolled down from above; but with all our care, we did not reach the bottom without several falls and slight bruises. The steep which we had descended was formed of volcanic matter, apparently a light red and gray kind of lava, vesicular, and lying in horizontal strata, varying in thickness from one to forty feet. In a small number of places the different strata of lava were also rent in perpendicular or oblique directions, from the top to the bottom, either by earthquakes, or other violent lsions of the ground connected with the action e adjacent volcano. After walking some dis- over the sunken plain, which in several places ed hollow under our feet, we at length came to lge of the great crater, where a spectacle, sub- nd even appalling, presented itself before us—

'We stopped and trembled.'

ishment and awe for some moments rendered ute, and, like statues, we stood fixed to the with our eyes rivetted on the abyss below. diately before us yawned an immense gulf, in the of a crescent, about two miles in length, from east to south-west, nearly a mile in width, and ently 800 feet deep. The bottom was covered ava, and the south-west and northern parts of e one vast flood of burning matter, in a state of c ebullition, rolling to and fro its 'fiery surge' aming billows. Fifty-one conical islands, of form and size, containing so many craters, rose round the edge or from the surface of the burn- ke. Twenty-two constantly emitted columns y smoke, or pyramids of brilliant flame; and l of these at the same time vomited from their l mouths streams of lava, which rolled in blazing ts down their black indented sides into the boil- ss below. The existence of these conical craters to conclude, that the boiling caldron of lava us did not form the focus of the volcano; that ass of melted lava was comparatively shallow; at the basin in which it was contained was sep- , by a stratum of solid matter, from the great ic abyss, which constantly poured out its l contents through these numerous craters into pper reservoir. We were further inclined to pinion, from the vast columns of vapour con- y ascending from the chasms in the vicinity of lphur banks and pools of water, for they must been produced by other fire than that which the ebullition of the lava at the bottom of the rater; and also by noticing a number of small , in vigorous action, situated high up the sides great gulf, and apparently quite detached from it. treams of lava which they emitted, rolled down e lake, and mingled with the melted mass there, , though thrown up by different apertures, had s been originally fused in one vast furnace. ides of the gulf before us, although composed erent strata of ancient lava, were perpendicular out 400 feet, and rose from a wide horizontal of solid black lava of irregular breadth, but ex- g completely round. Beneath this ledge the sloped gradually towards the burning lake, was, as nearly as we could judge, 300 or 400 wer. It was evident that the large crater had ecently filled with liquid lava up to this black and had, by some subterranean canal, emptied nto the sea, or upon the low land on the shore; all probability this evacuation had caused the tion of the Kapapala coast, which took place, afterwards learned, about three weeks prior to sit. The gray, and in some places apparently ed, sides of the great crater before us; the fis- which intersected the surface of the plain on we were standing; the long banks of sulphur opposite side of the abyss; the vigorous action numerous small craters on its borders; the columns of vapour and smoke that rose at the and south end of the plain; together with the of steep rocks by which it was surrounded, probably in some places 300 or 400 feet in perpen- height, presented an immense volcanic pano- the effect of which was greatly augmented by nstant roaring of the vast furnaces below."

CHAP. X.

OF EARTHQUAKES.

Having given the theory of volcanoes, we have in some measure given also that of earthquakes. They both seem to proceed from the same cause, only with this difference, that the fury of the volcano is spent in the eruption; that of an earthquake spreads wider, and acts more fatally by being confined. The volcano only affrights a province; earthquakes have laid whole kingdoms in ruin.

Philosophers[1] have taken some pains to distinguish between the various kinds of earthquakes, such as, the tremulous, the pulsative, the perpendicular, and the inclined; but these are rather the distinctions of art than of nature, mere accidental differences arising from the situation of the country or of the cause. If, for instance, the confined fire acts directly under a province or a town, it will heave the earth perpendicularly upward, and produce a *perpendicular* earthquake. If it acts at a distance, it will raise that tract obliquely, and thus the inhabitants will perceive an *inclined* one.

Nor does it seem to me that there is much greater reason for Mr. Buffon's distinction of earthquakes; one kind of which he supposes[2] to be produced by fire in the manner of volcanoes, and confined but to a very narrow circumference. The other kind he ascribes to the struggles of confined air, expanded by heat in the bowels of the earth, and endeavouring to get free. For how do these two causes differ? Fire is an agent of no power whatsoever without air. It is the air, which being at first compressed, and then dilated in a cannon, that drives the ball with such force. It is the air struggling for vent in a volcano, that throws up its contents to such vast heights. In short, it is the air confined in the bowels of the earth, and acquiring elasticity by heat, that produces all those appearances that are generally ascribed to the operation of fire. When, therefore, we are told that there are two causes of earthquakes, we only learn that a greater or smaller quantity of heat produces those terrible effects; for air is the only active operator in either.

Some philosophers, however, have been willing to give the air as great a share in producing these terrible efforts as they could; and, magnifying its powers, have called in but a very moderate degree of heat to put it in action. Although experience tells us that the earth is full of inflammable materials, and that fires are produced wherever we descend; although it tells us that those countries where there are volcanoes, are most subject to earthquakes; yet they step out of their way, and so find a new solution. These only allow but just heat enough to produce the most dreadful phenomena, and, backing their assertions with long calculations, give theory an air of demonstration. Mr. Amontons[3] has been particularly sparing of the internal heat in this respect; and has shown, perhaps accurately enough, that a very moderate degree of heat may suffice to give the air amazing powers of expansion.

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[1] Aristotle, Agricola, Buffon.

[2] Buffon, vol. ii. p. 328.

It is astonishing, however, to trace the progress of a philosophical fancy let loose in imaginary speculations. They run thus: "A very moderate degree of heat may bring the air into a condition capable of producing earthquakes; for the air, at the depth of forty-three thousand five hundred and twenty-eight fathoms below the surface of the earth, becomes almost as heavy as quicksilver. This, however, is but a very slight depth in comparison of the distance to the centre, and is scarcely a seventieth part of the way. The air, therefore, at the centre, must be infinitely heavier than mercury, or any body that we know of. This granted, we shall take something more, and say, that it is very probable there is nothing but air at the centre. Now, let us suppose this air heated, by some means, even to the degree of boiling water, as we have proved that the density of the air is here very great, its elasticity must be in proportion; a heat, therefore, which at the surface of the earth would have produced but a slight expansive force, must, at the centre, produce one very extraordinary, and, in short, be perfectly irresistible. Hence this force may, with great ease, produce earthquakes; and if increased it may convulse the globe; it may (by only adding figures enough to the calculation) destroy the solar system, and even the fixed stars themselves." These reveries generally produce nothing: for, as I have ever observed, increased calculations, while they seem to tire the memory, give the reasoning faculty perfect repose.

However, as earthquakes are the most formidable ministers of nature, it is not to be wondered that a multitude of writers have been curiously employed in their consideration. Woodward has ascribed the cause to a stoppage of the waters below the earth's surface by some accident. These being thus accumulated, and yet acted upon by fires, which he supposes still deeper, both contribute to heave up the earth upon their bosom. This, he thinks, accounts for the lakes of water produced in an earthquake, as well as for the fires that sometimes burst from the earth's surface upon those dreadful occasions. There are others who have supposed that the earth may be itself the cause of its own convulsions. "When," say they, "the root or basis of some large tract is worn away by a fluid underneath, the earth sinking therein, its weight occasions a tremor of the adjacent parts, sometimes producing a noise, and sometimes an inundation of water." Not to tire the reader with a history of opinions instead of facts, some have ascribed them to electricity, and some to the same causes that produce thunder.

It would be tedious, therefore, to give all the various opinions that have employed the speculative on this subject. The activity of the internal heat seems alone sufficient to account for every appearance that attends these tremendous irregularities of nature. To conceive this distinctly, let us suppose at some vast distance under the earth, large quantities of inflammable matter, pyrites, bitumens, and marcasites, disposed, and only waiting for the aspersion of water, or the humidity of the air, to put their fires in motion; at last, this dreadful mixture arrives; waters find their way into those depths through the perpendicular fissures; or air insinuates itself through the same minute apertures: immediately new appearances ensue; those substances which for ages before lay dormant, now conceive new apparent qualities: they grow hot, produce new air, and only want room for expansion. However, the narrow apertures by which the air or water had at first admission are now closed up; yet as new air is continually generated, and as the heat every moment gives this air new elasticity, it at length bursts, and dilates all round; and, in its struggles to get free, throws all above it into similar convulsions. Thus an earthquake is produced more or less extensive, according to the depth or the greatness of the cause.[4]

But before we proceed with the causes, let us take a short view of the appearances which have attended the most remarkable earthquakes. By these we shall see how far the theorist corresponds with the historian. The greatest we find in antiquity is that mentioned by Pliny,[5] in which twelve cities in Asia Minor were swallowed up in one night: he tells us also of another near the lake Thrasymene, which was not perceived by the armies of the Carthaginians and Romans, that were then engaged near that lake, although it shook the greatest part of Italy. In another place[6] he gives the following account of an earthquake of an extraordinary kind. "When Lucius Marcus and Sextus Julius were consuls there appeared a very strange prodigy of the earth, (as I have read in the books of the Ætruscan discipline,) which happened in the province of Mutina. Two mountains shocked against each other, approaching and retiring with the most dreadful noise. They at the same time, and in the midst of the day, appeared to cast forth fire and smoke, while a vast number of Roman knights and travellers from the Æmilian Way, stood and continued amazed spectators. Several towns were destroyed by this shock; and all the animals that were near them were killed." In the times of Trajan, the city of Antioch, and a great part of the adjacent country, was buried by an earthquake. About three hundred years after, in the times of Justinian, it was once more destroyed together with forty thousand inhabitants; and, after an interval of sixty years, the same ill-fated city was a third time overturned, with the loss of not less than sixty thousand souls. In the year 1182, most of the cities of Syria, and the kingdom of Jerusalem, were destroyed by the same accident. In the year 1594, the Italian historians describe an earthquake at Puteoli, which caused the sea to retire two hundred yards from its former bed.

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[3] Memoires de l'Academie des Sciences, An. 1703.

[4] See Supplementary Note A, p. 101.

[5] Plin. lib. ii. cap. 86.

[6] Ibid. lib. iii. cap. 85.

But one of those most particularly described in history, is that of the year 1693; the damages of which were chiefly felt in Sicily, but its motion perceived in Germany, France, and England. It extended to a circumference of two thousand six hundred leagues; chiefly affecting the sea-coasts and great rivers; more perceivable also upon the mountains than in the valleys. Its motions were so rapid that those who lay at their length were tossed from side to side, as upon a rolling billow. The walls were dashed from their foundations; and no less than fifty-four cities, with an incredible number of villages, were either destroyed, or greatly damaged. The city of Catanea, in particular, was utterly overthrown. A traveller, who was on his way thither, at the distance of some miles, perceived a black cloud, like night, hanging over the place. The sea, all of a sudden, began to roar; Mount Ætna to send forth great spires of flame; and soon after a shock ensued, with a noise as if all the artillery in the world had been at once discharged. Our traveller, being obliged to alight, instantly felt himself raised a foot from the ground; and turning his eyes to the city, he, with amazement, saw nothing but a thick cloud of dust in the air. The birds flew about astonished; the sun was darkened; the beasts ran howling from the hills; and although the shock did not continue above three minutes, yet near nineteen thousand of the inhabitants of Sicily perished in the ruins.—Catanea, to which city the describer was travelling, seemed the principal scene of ruin; its place only was to be found; and not a footstep of its former magnificence was to be seen remaining.

The earthquake which happened in Jamaica, in 1692, was very terrible, and its description sufficiently minute. "In two minutes' time it destroyed the town of Port Royal, and sunk the houses in a gulf forty fathoms deep. It was attended with a hollow rumbling noise, like that of thunder; and, in less than a minute, three parts of the houses, and their inhabitants, were all sunk quite under water. While they were thus swallowed up on one side of the street, on the other the houses were thrown into heaps; the sand of the street rising like the waves of the sea, lifting up those that stood upon it, and immediately overwhelming them in pits. All the wells discharged their waters with the most vehement agitation. The sea felt an equal share of turbulence, and, bursting over its mounds, deluged all that came in its way. The fissures of the earth were, in some places, so great, that one of the streets appeared twice as broad as formerly. In many places, however, it opened and closed again, and continued this agitation for some time. Of these openings, two or three hundred might be seen at a time; in some whereof the people were swallowed up; in others, the earth closing, caught them by the middle, and thus crushed them instantly to death. Other openings, still more dreadful than the rest, swallowed up whole streets; and others, more formidable, spouted up whole cataracts of water, drowning such as the earthquake had spared. The whole was attended with the most noisome stench; while the thundering of the distant falling mountains, the whole sky overcast with a dusky gloom, and the crash of falling habitations, gave unspeakable horror to the scene. After this dreadful calamity was over, the whole island seemed converted into a scene of desolation; scarcely a planter's house was left standing; almost all were swallowed up; houses, people, trees, shared one universal ruin: and in their places appeared great pools of water, which, when dried up by the sun, left only a plain of barren sand, without any vestige of former inhabitants. Most of the rivers, during the earthquake, were stopped up by the falling in of the mountains; and it was not till after some time that they made themselves new channels. The mountains seemed particularly attacked by the force of the shock; and it was supposed that the principal seat of the concussion was among them. Those who were saved got on board ships in the harbour, where many remained above two months; the shocks continuing, during that interval, with more or less violence every day."

As this description seems to exhibit all the appearances that usually make up the catalogue of terrors belonging to an earthquake, I will suppress the detail of that which happened at Lisbon in our own times, and which is too recent to require a description.[7] In fact there are few particulars in the accounts of those who were present at that scene of desolation, that we have not more minutely and accurately transmitted to us by former writers, whose narratives I have for that reason preferred. I will therefore close this description of human calamities with the account of the dreadful earthquake at Calabria, in 1638. It is related by the celebrated Father Kircher, as it happened while he was on his journey to visit Mount Ætna, and the rest of the wonders that lie towards the south of Italy. I need scarcely inform the reader, that Kircher is considered, by scholars, as one of the greatest prodigies of learning.

"Having hired a boat, in company with four more, two friars of the order of St. Francis, and two seculars, we launched, on the twenty-fourth of March, from the harbour of Messina in Sicily, and arrived the same day at the promontory of Pelorus. Our destination was for the city of Euphæmia, in Calabria, where we had some business to transact, and where we designed to tarry for some time. However, Providence seemed willing to cross our design; for we were obliged to continue for three days at Pelorus, upon account of the weather; and though we often put out to sea, yet we were as often driven back. At length, however, wearied with the delay, we resolved to prosecute our voyage; and, although the sea seemed more than usually agitated, yet we ventured forward. The gulf of Charybdis, which we approached, seemed whirled round in such a manner as to form a vast hollow, verging to a point in the centre. Proceeding onward, and turning my eyes to Ætna, I saw it cast forth large volumes of smoke, of mountainous sizes, which entirely covered the whole island, and blotted out the very shores from my view. This, together with the dreadful noise, and the sulphureous stench, which was strongly perceived, filled me with apprehensions that some more dreadful calamity was impending. The sea itself seemed to wear a very unusual appearance; those who have seen a lake in a violent shower of rain covered all over with bubbles, will conceive some idea of its agitations. My surprise was still increased by the calmness and serenity of the weather; not a breeze, not a cloud, which might be supposed to put all nature thus into motion. I therefore warned my companions that an earthquake was approaching; and, after some time making for the shore with all possible diligence, we landed at Tropæa, happy and thankful for having escaped the threatening dangers of the sea.

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[7] See Supplementary Note B, p. 102.

"But our triumphs at land were of short duration: for we had scarcely arrived at the Jesuits' College in that city, when our ears were stunned with a horrid sound, resembling that of an infinite number of chariots driven fiercely forward, the wheels rattling, and the thongs cracking. Soon after this a most dreadful earthquake ensued, so that the whole tract upon which we stood seemed to vibrate, as if we were in the scale of a balance that continued wavering. This motion, however, soon grew more violent; and being no longer able to keep my legs, I was thrown prostrate upon the ground. In the meantime, the universal ruin round me redoubled my amazement. The crash of falling houses, the tottering of towers, and the groans of the dying, all contributed to raise my terror and despair. On every side of me I saw nothing but a scene of ruin, and danger threatening wherever I should fly. I commended myself to God, as my last great refuge. At that hour, O how vain was every sublunary happiness! wealth, honour, empire, wisdom, all mere useless sounds, and as empty as the bubbles in the deep. Just standing on the threshold of eternity, nothing but God was my pleasure; and the nearer I approached, I only loved him the more.—After some time, however, finding that I remained unhurt amidst the general concussion, I resolved to venture for safety, and running as fast as I could, reached the shore, but almost terrified out of my reason. I did not search long here till I found the boat in which I had landed, and my companions also, whose terrors were even greater than mine. Our meeting was not of that kind where every one is desirous of telling his own happy escape; it was all silence, and a gloomy dread of impending terrors.

"Leaving this seat of desolation, we prosecuted our voyage along the coast, and the next day came to Rochetta, where we landed, although the earth still continued in violent agitations. But we were scarcely arrived at our inn, when we were once more obliged to return to the boat, and in about half-an-hour we saw the greatest part of the town, and the inn at which we had set up, dashed to the ground, and burying all its inhabitants beneath its ruins.

"In this manner, proceeding onward in our little vessel, finding no safety at land, and yet, from the smallness of our boat, having but a very dangerous continuance at sea, we at length landed at Lopizium, a castle midway between Tropæa and Euphæmia, the city to which, as I said before, we were bound. Here, wherever I turned my eyes, nothing but scenes of ruin and horror appeared; towns and castles levelled to the ground; Strombolo, though at sixty miles' distance, belching forth flames in an unusual manner, and with a noise which I could distinctly hear. But my attention was quickly turned from more remote to contiguous danger. The rumbling sound of an approaching earthquake, which we by this time were grown acquainted with, alarmed us for the consequences; it every moment seemed to grow louder, and to approach more near. The place on which we stood now began to shake most dreadfully, so that being unable to stand, my companions and I caught hold of whatever shrub grew next us, and supported ourselves in that manner.

"After some time, this violent paroxysm ceasing, we again stood up, in order to prosecute our voyage to Euphæmia, that lay within sight. In the meantime, while we were preparing for this purpose, I turned my eyes towards the city, but could see only a frightful dark cloud that seemed to rest upon the place. This the more surprised us, as the weather was so very serene. We waited, therefore, till the cloud was passed away: then turning to look for the city, it was totally sunk. Wonderful to tell! nothing but a dismal and putrid lake was to be seen where it stood. We looked about to find some that could tell us of its sad catastrophe, but could see none! All was become a melancholy solitude! a scene of hideous desolation! Thus proceeding pensively along, in quest of some human being that could give us some little information, we at length saw a boy sitting by the shore, and appearing stupified with terror. Of him, therefore, we inquired concerning the fate of the city, but he could not be induced to give us an answer. We entreated him with every expression of tenderness and pity to tell us: but his senses were quite wrapt up in the contemplation of the danger he had escaped. We offered him some victuals, but he seemed to loathe the sight. We still persisted in our offices of kindness; but he only pointed to the place of the city, like one out of his senses; and then running up into the woods, was never heard of after. Such was the fate of the city of Euphæmia! and as we continued our melancholy course along the shore, the whole coast, for the space of two hundred miles, presented nothing but the remains of cities, and men scattered, without a habitation, over the fields. Proceeding thus along, we at length ended our distressful voyage by arriving at Naples, after having escaped a thousand dangers both by sea and land."

The reader, I hope, will excuse me for this long translation from a favourite writer, and that the sooner, as it contains some particulars relative to earthquakes not to be found elsewhere. From the whole of these accounts we may gather, that the most concomitant circumstances are these:

A rumbling sound before the earthquake. This proceeds from the air or fire, or both, forcing their way through the chasms of the earth, and endeavouring to get free; which is also heard in volcanoes.

A violent agitation or heaving of the sea, sometimes before and sometimes after that at land. This agitation is only a similar effect produced on the waters with that at land, and may be called, for the sake of perspicuity, a *seaquake;* and this also is produced by volcanoes.

A spouting up of waters to great heights. It is not easy to describe the manner in which this is performed: but volcanoes also perform the same; Vesuvius being known frequently to eject a vast body of water.

A rocking of the earth to and fro, and sometimes a perpendicular bouncing, if it may be so called, of the same. This difference chiefly arises from the situation of the place with respect to the subterranean fire. Directly under, it lifts; at a farther distance, it rocks.

Some earthquakes seem to travel onward, and are felt in different countries at different hours the same day. This arises from the great shock being given to the earth at one place, and that being communicated onward by an undulatory motion, successively affects different regions in its progress; as the blow given by a stone falling in a lake, is not perceived at the shores till some time after the first concussion.

The shock is sometimes instantaneous, like the explosion of gunpowder; and sometimes tremulous, and continuing for several minutes. The nearer the place where the shock is first given, the more instantaneous and simple it appears. At a greater distance, the earth redoubles the first blow with a sort of vibratory continuation.

As waters have generally so great a share in producing earthquakes, it is not to be wondered that they should generally follow those breaches made by the force of fire, and appear in the great chasms which the earthquake has opened.

These are some of the most remarkable phenomena of earthquakes, presenting a frightful assemblage of the most terrible effects of air, earth, fire, and water.

The valley of Solfatara, near Naples, seems to exhibit, in a minuter degree, whatever is seen of this horrible kind on the great theatre of nature. This plain, which is about twelve hundred feet long, and a thousand broad, is embosomed in mountains, and has in the middle of it a lake of noisome blackish water, covered with a bitumen that floats upon its surface. In every part of this plain, caverns appear smoking with sulphur, and often emitting flames. The earth, wherever we walk over it, trembles beneath the feet. Noises of flames, and the hissing of waters, are heard at the bottom. The water sometimes spouts up eight or ten feet high. The most noisome fumes, fetid water, and sulphureous vapours, offend the smell. A stone thrown into any of the caverns, is ejected again with considerable violence. These appearances generally prevail when the sea is any way disturbed; and the whole seems to exhibit the appearance of an earthquake in miniature. However, in this smaller scene of wonders as well as in the greater, there are many appearances for which, perhaps, we shall never account; and many questions may be asked, which no conjectures can thoroughly resolve. It was the fault of the philosophers of the last age, to be more inquisitive after the causes of things than after the things themselves. They seemed to think that a confession of ignorance cancelled their claims to wisdom; they, therefore, had a solution for every demand. But the present age has grown, if not more inquisitive, at least more modest; and none are now ashamed of that ignorance, which labour can neither remedy nor remove.

NOTE A.

In a preceding note [A, p. 89] we have noticed M. Cordier's theory. He considers the whole globe as a mass of fused matter, covered with a solid crust or shell, upon which man and all his works are suspended over the molten abyss. "This theory," says a journalist of great intelligence, "accounts for the frequency of volcanoes in the early stages of the globe's existence, when the crust was thin, the contraction rapid, and the fracture of its parts easy. As it increases in thickness, changes in its figure or volume become more difficult, and must be chiefly confined to the inner coats, among which it is probable that void spaces may be left; into these the fluid matter may be injected, which in earlier times would have reached the surface and formed eruptions. Assuming that the thickness of the crust is

60 miles, it would require a pressure equal to that of 28,000 atmospheres to make the fused lava reach the surface. Hence we see why such a vast number of volcanoes are found everywhere on the earth's surface, which were once active but are now extinguished. In early times, when the earth was perfectly fluid at the surface, the attraction of the sun and moon would produce tides in the molten mass exactly as it does now in the ocean. These tides, which must have been four or five yards in height, would exert a disturbing force on the crusts, while it was consolidating, by breaking and displacing its parts, and may have been one cause of the confused and fractured appearance of the primitive rocks. The same phenomena must exist even yet in the interior of the earth, but its influence must be extremely feeble. The rents and fractures produced still by contractions, especially in the interior, and perhaps still more the gaseous matter disengaged during refrigeration (as the phenomena of volcanoes prove), but kept pent up within the exterior shell exposed to an excessive temperature, explain the origin of earthquakes. These are most frequent in the regions of the globe where we would expect the crust to be thinnest, and the operation of the disturbing causes most violent. In all probability, it is the gaseous matter disengaged from the rocks during refrigeration that impregnates those mineral springs, in which a portion of such matter exists. M. Cordier observes that these springs should have been more numerous in early ages, and various phenomena he thinks announce that this was the case. The gradual refrigeration of the earth explains other facts which have perplexed philosophers. It accounts, for instance, for so large a portion of fossil plants and animals found in cold countries, having the characters of those species which now belong to the tropics. Again, it has been observed, that the land surrounding the upper parts of the Baltic has risen from two to three feet within a century, while the French savans have inferred from certain marks at the ruins of Tanis in Egypt, that the African continent is subsiding at the rate of a foot in a century. Considering all large portions of land as solid masses floating over a liquid abyss, and receiving unequal additions from below, we can easily understand why one part may rise and another descend. Lastly, as the metals are undoubtedly mixed with the fluid mass below, and the whole in consequence of its fluidity may have certain slow regular motions within itself, we have a key to the mysterious phenomena of magnetism—the variation of dip and polarity."

NOTE B.—*Great Earthquake at Lisbon.*

Goldsmith here alludes to the great earthquake of 1755. It appears to have originated beneath the Atlantic ocean, the waves of which received almost as violent a concussion as the land. Its effects were even extended to the waters in many places where the shocks were not perceptible. It pervaded the greater portions of the continents of Europe, Africa, and America; but its extreme violence was exercised on the south-western parts of the former. Lisbon, the Portuguese capital, had already suffered greatly from an earthquake in 1531; and, since the calamity about to be described, has had three such visitations, in 1761, 1765, and 1772, which were not, however, attended by equally disastrous consequences. In the present instance, it had been remarked, that, since the commencement of the year 1750, less rain had fallen than had been known in the memory of the oldest of their inhabitants, unless during the spring preceding the calamitous event. The summer had been unusually cool, and the weather fine and clear for the last forty days. At length, on the 1st of November, about forty minutes past nine in the morning, a most violent shock of an earthquake was felt; its duration did not exceed six seconds; but so powerful was the concussion, that it overthrew every church and convent in the city, together with the royal palace and the magnificent opera-house adjoining to it; in short, not any building of consequence escaped. About one-fourth of the dwelling-houses were thrown down: and, at a moderate computation, 30,000 individuals perished. Between the 1st and 8th of November, twenty-two shocks were reckoned. This earthquake was also felt at Oporto, Cadiz, and other parts of Europe, and equally severe in Africa. A great part of the city of Algiers was destroyed. In many places of Germany the effects of this earthquake were very perceptible; but in Holland the agitations were still more remarkable. The agitation of the waters was also perceived in various parts of Great Britain and Ireland. At sea, the shocks of this earthquake were felt most violently. Among other catastrophes, the captain of the *Nancy* frigate, off St. Lucar, felt his ship so violently shaken, that he thought she had struck the ground, but on heaving the lead, found she was in a great depth of water. The earthquakes in Sicily and the two Calabrias began on the 5th of February, 1783, and continued until the latter end of the May following; doing infinite damage, and exhibiting at Messina, in the parts of Sicily nearest to the continent, and in the two Calabrias, a variety of phenomena. The earth was in a constant tremor, and its motions were various, being either vertical or whirling round,—horizontal or oscillatory, that is, by pulsations or beatings from the bottom upwards. There were many openings or cracks in the earth; and several hills had been lowered, while others were quite level. In the plains, the chasms were so deep that many roads were rendered impassable. Huge mountains were severed, and portions of them driven into the valleys, which were thus filled up. The total amount of the mortality occasioned by these earthquakes in Sicily and the two Calabrias, was, agreeably to the official returns, 32,367; but Sir William Hamilton thought it still greater, and carries his estimation to 40,000, including foreigners. The shocks felt since the commencement of these formidable earthquakes amounted to several hundreds; and among the most violent may be reckoned the one which happened on the 28th of March. It affected most of the higher parts of Upper Calabria, and the inferior part of Lower Calabria, being equally tremendous with the first. Indeed these shocks were the only ones sensibly felt in the capital, Naples. With relation to the former, two singular phenomena are recorded. At a distance of about three miles from the ruined city of Oppido, in Upper Calabria, was a hill, having a sandy and clayey soil, nearly 400 feet in height, and nearly 900 feet in circumference at its base. This hill is said to have been carried to the distance of about four miles from the spot where it stood, into a plain called Campo de Bassano. At the same time, the hill on which the city of Oppido stood, and which extended about three miles, divided into two parts, being situated between two rivers, its ruins filled up the valley, and stopped their course, forming two large lakes, which augmented daily. By the earthquake experienced in Chili in 1822, a great line of coast is stated to have been lifted permanently up to the height of several feet above its former level: and it deserves remark, that though earthquakes are sometimes felt in the interior of countries, their most terrible effects occur chiefly along the coast. On the 2d March, 1825, the city of Algiers was visited with a tremendous earthquake, which destroyed at least 10,000 human beings. It is worthy of remark, that the same phenomena which generally precedes the eruption of Ætna and Vesuvius, occurred at Bluda, on this occasion; namely, all the wells and ns in the neighbourhood became perfectly dry. rometer had fallen gradually for some days be- e earthquake; and the thermometer rose sud- rom 58 to 62½ degrees on the day it happened.

CHAP. XI.

APPEARANCE OF NEW ISLANDS AND TRACTS; AND OF THE DISAPPEARING OF OTHERS.

RTO we have taken a survey only of the which are produced by subterranean fires, e have mentioned nothing of the benefits ay possibly produce. They may be of use rming and cherishing the ground, in pro- vegetation, and giving a more exquisite to the productions of the earth. The ation of a person who has never been out own mild region, can scarcely reach to uxuriant beauty with which all nature s clothed in those very countries that we but just now described as desolated by uakes, and undermined by subterranean It must be granted, therefore, that though se regions they have a greater share in the s, they have also a larger proportion in nefits of nature.

there is another advantage arising from ranean fires, which, though hitherto dis- ed by man, yet may one day become able to him; I mean, that while they are to swallow up cities and plains in one they are also known to produce promon- and islands in another. We have many ces of islands being thus formed in the of the sea, which, though for a long time , have afterwards become fruitful seats of ess and industry.

islands are formed in two ways: either ly, by the action of subterraneous fires; e slowly, by the deposition of mud, carried by rivers, and stopped by some accident.[1] respect particularly to the first, ancient ans, and modern travellers, give us such ts as we can have no room to doubt of. assures us, that in his time the island of ia appeared unexpectedly to some mariners, were employed in another pursuit. Pliny s us, that thirteen islands in the Mediter- appeared at once emerging from the ; the cause of which he ascribes rather to tiring of the sea in those parts, than to bterraneous elevation. However, he men- he island of Hiera, near that of Therasia, ned by subterraneous explosions; and adds list several others formed in the same r. In one of which he relates that fish at abundance were found, and that all who ate of them died shortly after.

the twenty-fourth of May,[2] in the year 1707, a slight earthquake was perceived at Santorin; and the day following, at sun-rising, an object was seen by the inhabitants of that island, at two or three miles' distance at sea, which appeared like a floating rock. Some persons, desirous either of gain, or incited by curiosity, went there, and found, even while they stood upon this rock, that it seemed to rise beneath their feet. They perceived also, that its surface was covered with pumice-stones and oysters, which it had raised from the bottom. Every day after, until the fourteenth of June, this rock seemed considerably to increase; and then was found to be half-a-mile round, and about thirty feet above the sea. The earth of which it was composed seemed whitish, with a small portion of clay. Soon after this the sea again appeared troubled, and steams arose which were very offensive to the inhabitants of Santorin. But on the sixteenth of the succeeding month, seventeen or eighteen rocks more were seen to rise out of the sea, and at length to join together. All this was accompanied with the most terrible noise, and fires which proceeded from the island that was newly formed. The whole mass, however, of all this new-formed earth, uniting, increased every day, both in height and breadth, and, by the force of its explosions, cast forth rocks to seven miles' distance. This continued to bear the same dreadful appearances till the month of November in the same year; and it is at present a volcano, which sometimes renews its explosions. It is about three miles in circumference; and more than from thirty-five to forty feet high."

It seems extraordinary, that, about this place in particular, islands have appeared at different times, particularly that of Hiera, mentioned above, which has received considerable additions in succeeding ages. Justin tells us,[3] that at the time the Macedonians were at war with the Romans, a new island appeared between those of Theramenes and Therasia, by means of an earthquake. We are told that this became half as large again about a thousand years after, another island rising up by its side, and joining to it, so as scarcely at present to be distinguished from the former.

A new island was formed, in the year 1720, near that of Tercera, near the continent of Africa, by the same causes. In the beginning of December, at night, there was a terrible earthquake at that place, and the top of a new island appeared, which cast forth smoke in vast quantities. The pilot of a ship, who approached it, sounded on one side of this island, and could not find ground at sixty fathom; at the other side, the sea was totally tinged of a different colour, exhibiting a mixture of white, blue, and green; and was very shallow. This island, on its first appearance, was larger than it is at present; for

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ffon, vol. ii. p. 343.

t. de l'Acad. an. 1708, p. 23.

[3] Justin, lib. xxx. cap. 4.

it has since that time sunk in such a manner, as to be scarcely above water.[4]

A traveller, whom these appearances could not avoid affecting, speaks of them in this manner.[5] "What can be more surprising than to see fire not only break out of the bowels of the earth, but also to make itself a passage through the waters of the sea! What can be more extraordinary, or foreign to our common notions of things, than to see the bottom of the sea rise up into a mountain above the water, and to become so firm an island as to be able to resist the violence of the greatest storms. I know that subterraneous fires, when pent in a narrow passage, are able to raise up a mass of earth as large as an island: but that this should be done in so regular and exact a manner, that the water of the sea should not be able to penetrate and extinguish those fires; that after having made so many passages, they should retain force enough to raise the earth; and, in fine, after having been extinguished, that the mass of earth should not fall down, or sink again with its own weight, but still remain in a manner suspended over the great arch below! This is what to me seems more surprising than anything that has been related of mount Ætna, Vesuvius, or any other volcano."

Such are his sentiments: however, there are few of these appearances any way more extraordinary than those attending volcanoes and earthquakes in general. We are not more to be surprised that inflammable substances should be found beneath the bottom of the sea, than at similar depths at land. These have all the force of fire giving expansion to air, and tending to raise the earth at the bottom of the sea, till it at length heaves above water. These marine volcanoes are not so frequent; for, if we may judge of the usual procedure of nature, it must very often happen, that before the bottom of the sea is elevated above the surface, a chasm is opened in it, and then the water pressing in, extinguishes the volcano before it has time to produce its effects. This extinction, however, is not effected without very great resistance from the fire beneath. The water, upon dashing into the cavern, is very probably at first ejected back with great violence; and thus some of those amazing water-spouts are seen, which have so often astonished the mariner, and excited curiosity. But of these in their place.

Besides the production of those islands by the action of fire, there are others, as was said, produced by rivers or seas carrying mud, earth, and such like substances, along with their currents; and at last depositing them in some particular place.[6] At the mouths of most great rivers, there are to be seen banks, thus formed by the sand and mud carried down by the stream, which have rested at that place, where the force of the current is diminished by its junction with the sea. These banks, by slow degrees, increase at the bottom of the deep: the water at those places is at first found by mariners to grow more shallow; the bank soon heaves up above the surface; it is considered, for a while, as a tract of useless and barren sand; but the seeds of some of the more hardy vegetables are driven thither by the wind, take root, and thus binding the sandy surface, the whole spot is clothed in time with a beautiful verdure. In this manner there are delightful and inhabited islands at the mouths of many rivers, particularly the Nile, the Po, the Mississippi, the Ganges, and the Senegal. There has been, in the memory of man, a beautiful and large island formed in this manner at the mouth of the river Nanquin, in China, made from depositions of mud at its opening: it is not less than sixty miles long, and about twenty broad. In

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[4] In the spring of 1783, a volcanic island was formed about 30 miles from the south-west point of Iceland. The discoverer, Captain Von Lowenhorn, in the Danish service, who arrived just at the time of the first eruption, when smoke and flames ascended out of the sea, relates that no island or any land could be seen, from which these flames could originate. No wonder, then, that he fell into the greatest consternation, when, as he expresses himself, he saw the waves on fire. The following year, the Danish government directed, that all ships bound to Iceland should examine the new-formed island; but so entirely had it vanished, that none of them either saw or could discover the smallest trace of it. However, towards the end of the next year, a Danish ship of war, of 64 guns, was wrecked on this rock; which is now no longer visible, but remains a most dangerous rock nearly level with the surface of the water.

[5] Phil. Trans. vol. v. p. 197.

[6] Islands of coral are also formed in tropical regions. Coral is the produce of different species of vermes or worms, and it consists chiefly of carbonate of lime. Now it is difficult to conceive where these animals procure such prodigious quantities of this substance. Sea-water indeed contains traces of sulphate of lime, but no other calcareous salt, as far as is known. Hence it would appear, that these creatures must either decompose sulphate of lime, though the quantity of that salt contained in sea-water seems inadequate to supply their wants, or they must form carbonate of lime from the constituents of sea-water in a way totally above our conception. Be that as it may, there is one consequence of this copious formation of coral in the tropical regions of considerable importance to navigation. The winds and waves accumulate these corals in large banks, which entangling the sand, gradually rise above the surface of the waves, and form islands. These, in process of time, probably by the agency of birds, become covered with vegetation, and frequently loaded with timber. Mr. Ellis, in his history of zoophytes, supposes that the greater part of these numerous islands in the South sea have been formed by coral, rising above the surface of the water. The bottom of these islands is nothing else than a coral bank; the surface is a black soil, formed of a mixture of sand and decayed vegetable matter; the whole island is flat, long, and narrow; and extends usually in its greatest length from north to south, because almost all winds between the tropics blow either from the east or the west. The sides of these islands frequently constitute a perpendicular wall; and the sea at a little distance from them, is of an unfathomable depth.—ED.

Loubere informs us,[7] in his voyage to Siam, that these sand-banks increase every day, at the mouths of all the great rivers in Asia; and hence, he asserts, that the navigation up these rivers becomes every day more difficult, and will, at one time or other, be totally obstructed. The same may be remarked with regard to the Wolga, which has at present seventy openings into the Caspian sea; and of the Danube, which has seven into the Euxine. We have had an instance of the formation of a new island not very long since at the mouth of the Humber, in England. "It is yet within the memory of man," says the relater,[8] "since it began to raise its head above the ocean. It began its appearance at low water, for the space of a few hours, and was buried again till the next tide's retreat. Thus successively it lived and died, until the year 1666, when it began to maintain its ground against the insult of the waves, and then first invited the aid of human industry. A bank was thrown about its rising grounds, and being thus defended from the incursions of the sea, it became firm and solid, and, in a short time, afforded good pasturage for cattle. It is about nine miles in circumference, and is worth to the proprietor about eight hundred pounds a-year." It would be endless to mention all the islands that have been thus formed, and the advantages that have been derived from them. However, it is frequently found, that new islands may often be considered as only turning the rivers from their former beds; so that in proportion as land is gained at one part, it is lost by the overflowing of some other.

Little, therefore, is gained by such accessions; nor is there much more by the new islands which are sometimes formed from the spoils of the continent. Mariners assure us, that there are sometimes whole plains unrooted from the main lands, by floods and tempests. These being carried out to sea, with all their trees and animals upon them, are frequently seen floating in the ocean, and exhibiting a surprising appearance of rural tranquillity in the midst of danger. The greatest part, however, having the earth at their roots at length washed away, are dispersed and their animals drowned; but now and then some are found to brave the fury of the ocean, till being stuck either among rocks or sands, they again take firm footing, and become permanent islands.

As different causes have thus concurred to produce new islands, so we have accounts of others that the came causes have contributed to destroy. We have already seen the power of earthquakes exerted in sinking whole cities, and leaving lakes in their room. There have been islands, and regions also, that have shared the same fate; and have sunk with their inhabitants, never more to be heard of. Thus Pausanias[9] tells us of an island, called Chryses, that was sunk near Lemnos. Pliny mentions several; among others, the island Cea, for thirty miles, having been washed away, with several thousands of its inhabitants. But of all the noted devastations of this kind, the total submersion of the island of Atalantis, as mentioned by Plato, has been most the subject of speculation. Mankind, in general, now consider the whole of his account as an ingenious fable; but when fables are grown famous by time and authority, they become an agreeable, if not a necessary part of literary information.

"About nine thousand years are past," says Plato,[10] "since the island of Atalantis was in being. The priests of Egypt were well-acquainted with it; and the first heroes of Athens gained much glory in their wars with the inhabitants. This island was as large as Asia Minor and Syria united; and was situated beyond the Pillars of Hercules, in the Atlantic ocean. The beauty of the buildings, and the fertility of the soil, were far beyond any thing a modern imagination can conceive; gold and ivory were everywhere common; and the fruits of the earth offered themselves without cultivation. The arts, and the courage of the inhabitants, were not inferior to the happiness of their situation; and they were frequently known to make conquests, and overrun the continents of Europe and Asia. The imagination of the poetical philosopher riots in the description of the natural and acquired advantages, which they long enjoyed in this charming region. If," says he, "we compare that country to our own, ours will appear a mere wasted skeleton, when opposed to it. Their mountains to the very tops were clothed with fertility, and poured down rivers to enrich the plains below."

However, all these beauties and benefits were destroyed in one day by an earthquake sinking the earth, and the sea overwhelming it. At present, not the smallest vestiges of such an island are to be found; Plato remains as the only authority for its existence; and philosophers dispute about its situation. It is not for me to enter into the controversy, when there appears but little probability to support the fact; and, indeed, it would be useless to run back nine thousand years in search of difficulties, as we are surrounded with objects that more closely affect us, and that demand admiration, at our very doors. When I consider, as Lactantius suggests, the various vicissitudes of nature; lands swallowed by yawning earthquakes, or overwhelmed in the deep; rivers and lakes disappearing, or dried away; mountains levelled into plains; and plains swelling up into mountains; I cannot help regarding this earth as a place of very little stability; as a transient abode of still more transitory beings.

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[7] Lettres Curieuses et Edifiantes, sec. ix. p. 234.

[8] Phil. Trans. vol. iv. p. 251.

[9] Pausanias, lib. viii. in Arcad. p. 509.

[10] Plato in Critia.

CHAP. XII.

OF MOUNTAINS.

HAVING at last, in some measure, emerged from the deeps of the earth, we come to a scene of greater splendour; the contemplation of its external appearance. In this survey, its mountains are the first objects that strike the imagination, and excite our curiosity. There is not, perhaps, anything in all nature that impresses an unaccustomed spectator with such ideas of awful solemnity, as these immense piles of Nature's erecting, that seem to mock the minuteness of human magnificence.

In countries where there are nothing but plains, the smallest elevations are apt to excite wonder. In Holland, which is all a flat, they show a little ridge of hills, near the sea-side, which Boerhaave generally marked out to his pupils, as being mountains of no small consideration. What would be the sensations of such an auditory, could they at once be presented with a view of the heights and precipices of the Alps or the Andes! Even among us in England, we have no adequate ideas of a mountain-prospect: our hills are generally sloping from the plain, and clothed to the very top with verdure: we can scarcely, therefore, lift our imaginations to those immense piles, whose tops peep up behind intervening clouds, sharp and precipitate, and reach to heights that human avarice or curiosity have never been able to ascend.

We, in this part of the world, are not, for that reason, so immediately interested in the question which has so long been agitated among philosophers, concerning what gave rise to these inequalities on the surface of the globe. In our own happy region, we generally see no inequalities but such as contribute to use and beauty; and we, therefore, are amazed at a question inquiring how such necessary inequalities came to be formed, and seeming to express a wonder how the globe comes to be so beautiful as we find it. But though with us there may be no great cause for such a demand, yet in those places where mountains deform the face of Nature, where they pour down cataracts, or give fury to tempests, there seems to be good reason for inquiry either into their causes or their uses. It has been, therefore, asked by many, in what manner mountains have come to be formed; or for what uses they are designed?

To satisfy curiosity in these respects, much reasoning has been employed, and very little knowledge propagated. With regard to the first part of the demand, the manner in which mountains were formed, we have already seen the conjectures of different philosophers on that head. One supposing that they were formed from the earth's broken shell at the time of the deluge; another, that they existed from the creation, and only acquired their deformities in process of time; a third, that they owed their original to earthquakes; and still a fourth, with much more plausibility than the rest, ascribing them entirely to the fluctuations of the deep, which he supposes in the beginning to have covered the whole earth. Such as are pleased with disquisitions of this kind, may consult Burnet, Whiston, Woodward, or Buffon. Nor would I be thought to decry any mental amusements, that at worst keep us innocently employed; but, for my own part, I cannot help wondering how the opposite demand has never come to be made; and why philosophers have never asked how we come to have plains? Plains are sometimes more prejudicial to man than mountains. Upon plains, an inundation has greater power; the beams of the sun are often collected there with suffocating fierceness; they are sometimes found desert for several hundred miles together, as in the country east of the Caspian sea, although otherwise fruitful, merely because there are no risings nor depressions to form reservoirs, or collect the smallest rivulet of water. The most rational answer, therefore, why either mountains or plains were formed, seems to be, that they were thus fashioned by the hand of Wisdom, in order that pain and pleasure should be so contiguous, as that morality might be exercised either in bearing the one, or communicating the other.

Indeed, the more I consider this dispute respecting the formation of mountains, the more I am struck with the futility of the question. There is neither a straight line, nor an exact superficies, in all nature. If we consider a circle, even with mathematical precision, we shall find it formed of a number of small right lines, joining at angles, together. These angles, therefore, may be considered in a circle as mountains are upon our globe; and to demand the reason for the one being mountainous, or the other angular, is only to ask, why a circle is a circle, or a globe is a globe. In short, if there be no surface without inequality in nature, why should we be surprised that the earth has such? It has often been said, that the inequalities of its surface are scarce distinguishable, if compared to its magnitude; and I think we have every reason to be content with the answer.

Some, however, have avoided the difficulty by urging the final cause. They allege, that mountains have been formed merely because they are useful to man. This carries the inquirer but a part of the way; for no one can affirm, that in all places they are useful. The contrary is known by horrid experience, in those valleys that are subject to their influence. However, as the utility of any part of our earthly habitation is a very pleasing and flattering speculation to every philosopher, it is not to be wondered that much has been said to prove the usefulness of these. For this purpose many conjectures have been made, that have received a degree of assent even beyond their evidence; for men were unwilling to become more miserably wise.

It has been alleged, as one principal advantage that we derive from them, that they serve, like hoops or ribs, to strengthen our earth, and to bind it together. In consequence of this theory, Kircher has given us a map of the earth, in this manner hooped with its mountains; which might have a much more solid foundation, did it entirely correspond with truth.

Others have found a different use for them, especially when they run surrounding our globe; which is, that they stop the vapours which are continually travelling from the equator to the poles; for these being urged by the heat of the sun, from the warm regions of the line, must all be accumulated at the poles, if they were not stopped in their way by those high ridges of mountains which cross their direction. But an answer to this may be, that all the great mountains in America lie lengthwise, and therefore do not cross their direction.

But to leave these remote advantages, others assert, that not only the animal but vegetable part of the creation would perish for want of convenient humidity, were it not for their friendly assistance. Their summits are, by these, supposed to arrest, as it were, the vapours which float in the regions of the air. Their large inflections and channels are considered as so many basins prepared for the reception of those thick vapours, and impetuous rains, which descend into them. The huge caverns beneath are so many magazines or conservatories of water for the peculiar service of man: and those orifices by which the water is discharged upon the plain, are so situated as to enrich and render them fruitful, instead of returning through subterraneous channels to the sea, after the performance of a tedious and fruitless circulation.[1]

However this be, certain it is, that almost all our great rivers find their source among mountains; and, in general, the more extensive the mountain, the greater the river; thus the river Amazon, the greatest in the world, has its source among the Andes, which are the highest mountains on the globe; the river Niger travels a long course of several hundred miles from the Mountains of the Moon, the highest in all Africa; and the Danube and the Rhine proceed from the Alps, which are probably the highest mountains of Europe.

It needs scarcely be said, that, with respect to height, there are many sizes of mountains, from the gently rising upland, to the tall craggy precipice. The appearance is in general different in those of different magnitudes. The first are clothed with verdure to the very tops, and only seem to ascend to improve our prospects, or supply us with a purer air: but the lofty mountains of the other class have a very different aspect. At a distance their tops are seen, in wavy ridges, of the very colour of the clouds, and only to be distinguished from them by their figure; which, as I have said, resemble the billows of the sea.[2] As we approach, the mountain assumes a deeper colour; it gathers upon the sky, and seems to hide half the horizon behind it. Its summits also are become distinct, and appear with a broken and perpendicular line. What at first seemed a single hill, is now found to be a chain of continued mountains, whose tops running along in ridges, are embosomed in each other: so that the curvatures of one are fitted to the prominences of the opposite side, and form a winding valley between, often of several miles in extent; and all the way continuing nearly of the same breadth.

Nothing can be finer, or more exact, than Mr. Pope's description of a traveller straining up the Alps. Every mountain he comes to, he thinks will be the last; he finds, however, an unexpected hill rise before him; and that being scaled, he finds the highest summit almost at as great a distance as before. Upon quitting the plain, he might have left a green and fertile soil, and a climate warm and pleasing. As he ascends, the ground assumes a more russet colour; the grass becomes more mossy, and the weather more moderate. Still as he ascends, the weather becomes more cold, and the earth more barren. In this dreary passage he is often entertained with a little valley of surprising verdure, caused by the reflected heat of the sun collected into a narrow spot on the surrounding heights. But it much more frequently happens that he sees only frightful precipices beneath, and lakes of amazing depths; from whence rivers are formed, and fountains derive their original. On those places next the highest summits, vegetation is scarcely carried on; here and there a few plants of the most hardy kind appear. The air is intolerably cold; either continually refrigerated with frosts, or disturbed with tempests. All the ground here wears an eternal covering of ice, and snows that seem constantly accumulating. Upon emerging from this war of the elements, he ascends into a purer and a serener region, where vegetation is entirely ceased; where the precipices, composed entirely of rocks, rise perpendicularly above him; while he views beneath him all the combat of the elements; clouds at his feet, and thunders darting upward from their bosoms below.[3] A thousand meteors, which are never seen on the plain, present themselves. Circular rainbows;[4] mock suns; the shadow of the mountain projected upon the body of the air;[5] and the traveller's own image reflected as in a looking-glass, upon the opposite cloud.[6]

Such are, in general, the wonders that present themselves to a traveller in his journey either over the Alps or the Andes. But we must not suppose that this picture exhibits either a constant or an invariable likeness of those stupendous heights. Indeed, nothing can be more capricious or irregular than the forms of many of them. The tops of some run in ridges for a considerable length, without interruption; in others, the line seems indented by great valleys to an amazing depth. Sometimes a solitary and a single mountain rises from the bosom of the plain; and sometimes extensive plains, and even provinces, as those of Savoy and Quito, are found embosomed near the tops of mountains. In general, however, those countries that are most mountainous, are the most barren and uninhabitable.

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[1] Nature Displayed, vol. iii. p. 88.

[2] Lettres Philosophiques sur la Formation, &c. p. 196.

[3] Ulloa, vol. i.

[4] Ibid.

[5] Phil. Trans. vol. v. p. 152.

[6] Ulloa, vol. i.

If we compare the heights of mountains with each other, we shall find that the greatest and highest are found under the line.[7] It is thought by some, that the rapidity of the earth's motion in these parts, together with the greatness of the tides there, may have thrown up those stupendous masses of earth. But, be the cause as it may, it is a remarkable fact, that the inequalities of the earth's surface are greatest there. Near the poles, the earth, indeed, is craggy and uneven enough; but the heights of the mountains there are very inconsiderable. On the contrary, at the equator, where nature seems to sport in the amazing size of all her productions, the plains are extensive and the mountains remarkably lofty. Some of them are known to rise three miles perpendicular above the bed of the ocean.[8]

To enumerate the most remarkable of these, according to their size, we shall begin with the Andes, of which we have an excellent description by Ulloa, who went thither by command of the king of Spain, in company with the French Academicians, to measure a degree of the meridian. His journey up these mountains is too curious not to give an extract from it.

After many incommodious days' sailing up the river Guayaquil, he arrived at Caracol, a town situated at the foot of the Andes. Nothing could exceed the inconveniences which he experienced in this voyage, from the flies and moschettoes (an animal resembling our gnat). "We were the whole day," says he, "in continual motion to keep them off; but at night our torments were excessive. Our gloves, indeed, were some defence to our hands; but our faces were entirely exposed; nor were our clothes a sufficient defence for the rest of our bodies; for their stings penetrating through the cloth, caused a very painful and fiery itching. One night, in coming to an anchor near a large and handsome house that was uninhabited, we had no sooner seated ourselves in it, than we were attacked on all sides by swarms of moschettoes, so that it was impossible to have one moment's quiet. Those who had covered themselves with clothes made for this purpose, found not the smallest defence: wherefore, hoping to find some relief in the open fields, we ventured out, though in danger of suffering in a more terrible manner from the serpents. But both places were equally obnoxious. On quitting this inhospitable retreat, we the next night took up our quarters in a house that was inhabited; the host of which being informed of the terrible manner we had passed the night before, gravely told us, that the house we so greatly complained of, had been forsaken on account of its being the purgatory of a soul. But we had more reason to believe that it was quitted on account of its being the purgatory of the body. After having journeyed for upwards of three days, through boggy roads, in which the mules at every step sunk up to their bellies, we began at length to perceive an alteration in the climate; and having been long accustomed to heat, we now began to feel it grow sensibly colder.

"It is remarkable, that at Tariguagua we often see instances of the effects of two opposite temperatures, in two persons happening to meet: one of them leaving the plains below, and the other descending from the mountain. The former thinks the cold so severe, that he wraps himself up in all the garments he can procure; while the latter finds the heat so great, that he is scarce able to bear any clothes whatsoever. The one thinks the water so cold, that he avoids being sprinkled by it; the other is so delighted with its warmth, that he uses it as a bath. Nor is the case very different in the same person, who experiences the same diversity of sensation upon his journey up, and upon his return. This difference only proceeds from the change naturally felt at leaving a climate to which one has been accustomed, and coming into another of an opposite temperature.

"The ruggedness of the road from Tariguagua, leading up the mountain, is not easily described. In some parts the declivity is so great, that the mules can scarcely keep their footing; and in others the acclivity is equally difficult. The trouble of having people going before to mend the road, the pains arising from the many falls and bruises, and the being constantly wet to the skin, might be supported, were not these inconveniences augmented by the sight of such frightful precipices, and deep abysses, as must fill the mind with ceaseless terror. There are some places where the road is so steep, and yet so narrow, that the mules are obliged to slide down, without making any use of their feet whatsoever. On one side of the rider, in this situation, rises an eminence of several hundred yards; and on the other, an abyss of equal depth: so that if he in the least checks his mule so as to destroy the equilibrium, they both must unavoidably perish.

"After having travelled about nine days in this manner, slowly winding along the side of the mountain, we began to find the whole country covered with a hoar frost; and a hut, in which we lay, had ice on it. Having escaped many perils, we at length, after a journey of fifteen days, arrived upon the plain, on the extremity of which stands the city of Quito, the capital of one of the most charming regions upon earth. Here, in the centre of the torrid zone, the heat is not only very tolerable, but in some places the cold also is painful. Here they enjoy all the temperature and advantages of perpetual spring; their fields being always covered with verdure, and enamelled with flowers of the most lively colours. However, although this beautiful region be higher than any other country in the world, and although it took up so many days of painful journey in the ascent, it is still overlooked by tremendous mountains; their sides covered with snow, and yet flaming with volcanoes at the top. These seemed piled one upon the other, and rise to a most astonishing height, with great coldness. However, at a determined point above the surface of the sea, the congelation is found at the same height in all the mountains. Those parts which are not subject to a continual frost, have here and there growing upon them a rush, resembling the genista, but much more soft and flexible. Towards the extremity of the part where the rush grows, and the cold begins to increase, there is found a vegetable, with a round bulbous head, which, when dried, becomes of amazing elasticity. Higher up, the earth is entirely bare of vegetation, and seems covered with eternal snow. The most remarkable mountains are, that of Cotopaxi (already described as a volcano), Chimborazo, and Pichincha. Cotopaxi is more than three geographical miles above the surface of the sea; the rest are not much inferior. On the top of the latter was my station for measuring a degree of the meridian; where I suffered particular hardships from the intenseness of the cold, and the violence of the storms. The sky around was, in general, involved in thick fogs, which, when they cleared away, and the clouds, by their gravity, moved nearer to the surface of the earth, they appeared surrounding the foot of the mountain, at a vast distance below, like a sea, encompassing an island in the midst of it. When this happened, the horrid noises of tempests were heard from beneath, then discharging themselves on Quito, and the neighbouring country. I saw the lightnings issue from the clouds, and heard the thunders roll far beneath me. All this time, while the tempest was raging below, the mountain top, where I was placed, enjoyed a delightful serenity; the wind was abated; the sky clear; and the enlivening rays of the sun moderated the severity of the cold. However, this was of no very long duration, for the wind returned with all its violence, and with such velocity as to dazzle the sight; whilst my fears were increased by the dreadful concussions of the precipice, and the fall of enormous rocks; the only sounds that were heard in this frightful situation."

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[7] Buffon, *passim*.

[8] The mean height of the Himalaya chain is 15,600 feet; that of the Andes, 11,800; and that of the Alps, 7,700.—ED.

Such is the animated picture of these mountains, as given us by this ingenious Spaniard: and I believe the reader will wish that I had made the quotation still longer. A passage over the Alps, or a journey across the Pyrenees, appear petty trips or excursions in the comparison; and yet these are the most lofty mountains we know of in Europe.

If we compare the Alps with the mountains already described, we shall find them but little more than one-half of the height of the former. The Andes, upon being measured by the barometer, are found above three thousand one hundred and thirty-six toises or fathoms above the surface of the sea.[9] Whereas the highest point of the Alps is not above sixteen hundred. The one, in other words, is above three miles high; the other about a mile and a half. The highest mountains in Asia are Mount Taurus, Mount Immaus, Mount Caucasus, and the mountains of Japan.[10] Of these, none equals the Andes in height; although Mount Caucasus, which is the highest of them, makes very near approaches. Father Verbiest tells of a mountain in China, which he measured, and found a mile and a half high.[11] In Africa, the Mountains of the Moon, famous for giving source to the Niger and the Nile, are rather more noted than known. Of the Peak of Teneriffe, one of the Canary Islands that lie off this coast, we have more certain information. In the year 1727, it was visited by a company of English merchants, who travelled up to the top, where they observed its height, and the volcano on its very summit.[1] They found it a heap of mountains, the highest of which rises over the rest like a sugar-loaf, and gives a name to the whole mass. It is computed to be a mile and a half perpendicular from the surface of the sea. Kircher gives us an estimate of the heights of most of the other great mountains in the world; but as he has taken his calculations in general from the ancients, or from modern travellers who had not the art of measuring them, they are quite incredible. The art of taking the heights of places by the barometer, is a new and an ingenious invention. As the air grows lighter as we ascend, the fluid in the tube rises in due proportion: thus the instrument being properly marked, gives the height with a tolerable degree of exactness; at least enough to satisfy curiosity.

Few of our great mountains have been estimated in this manner; travellers having, perhaps, been deterred, by a supposed impossibility of breathing at the top. However, it has been invariably found, that the air in the highest that our modern travellers have ascended, is not at all too fine for respiration. At the top of the Peak of Teneriffe, there was found no other inconvenience from the air, except its coldness; at the top of the Andes, there was no difficulty of breathing perceived. The accounts, therefore, of those who have asserted that they were unable to breathe, although at much less heights, are greatly to be suspected. In fact, it is very natural for mankind to paint those obstacles as insurmountable, which they themselves have not had the fortitude or perseverance to surmount.

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[9] Ulloa, vol. i. p. 442.

[10] The Himalaya mountains between Hindostan and Thibet are ascertained to be the highest in the world. The Andes were till a late period considered to be the highest; but the most elevated peak, yet measured, of the Himalaya exceeds that of the Andes about 7,000 feet.—ED.

[11] Verbiest, a la Chine.

[12] Phil. Trans. vol. v

The difficulty and danger of ascending to the tops of mountains, proceeds from other causes, not the thinness of the air. For instance, some of the summits of the Alps have never yet been visited by man. But the reason is, that they rise with such a rugged and precipitate ascent, that they are utterly inaccessible. In some places they appear like a great wall of six or seven hundred feet high; in others, there stick out enormous rocks, that hang upon the brow of the steep, and every moment threaten destruction to the traveller below.

In this manner almost all the tops of the highest mountains are bare and pointed. And this naturally proceeds from their being so continually assaulted by thunders and tempests. All the earthy substances with which they might have been once covered, have for ages been washed away from their summits; and nothing is left remaining but immense rocks, which no tempest has hitherto been able to destroy.

Nevertheless, time is every day, and every hour, making depredations; and huge fragments are seen tumbling down the precipice, either loosened from the summit by frost or rains, or struck down by lightning. Nothing can exhibit a more terrible picture than one of these enormous rocks, commonly larger than a house, falling from its height, with a noise louder than thunder, and rolling down the side of the mountain. Doctor Plot tells us of one in particular, which being loosened from its bed, tumbled down the precipice, and was partly shattered into a thousand pieces. Notwithstanding, one of the largest fragments of the same, still preserving its motion, travelled over the plain below, crossed a rivulet in the midst, and at last stopped on the other side of the bank! These fragments, as was said, are often struck off by lightning, and sometimes undermined by rains; but the most usual manner in which they are disunited from the mountain, is by frost: the rains insinuating between the interstices of the mountain, continue there until there comes a frost, and then, when converted into ice, the water swells with an irresistible force, and produces the same effect as gunpowder, splitting the most solid rocks, and thus shattering the summits of the mountain.

But not rocks alone, but whole mountains are, by various causes, disunited from each other. We see in many parts of the Alps, amazing clefts, the sides of which so exactly correspond with the opposite, that no doubt can be made of their having been once joined together. At Cajeta,[13] in Italy, a mountain was split in this manner by an earthquake; and there is a passage opened through it, that appears as if elaborately done by the industry of man. In the Andes these breaches are frequently seen. That at Thermopylæ, in Greece has been long famous. The mountain of the Troglodytes, in Arabia, has thus a passage through it: and that in Savoy, which nature began, and which Victor Amadeus completed, is an instance of the same kind.

We have accounts of some of these disruptions, immediately after their happening. "In the month of June,[14] in the year 1714, a part of the mountain of Diableret, in the district of Valais, in France, suddenly fell down between two and three o'clock in the afternoon, the weather being very calm and serene. It was of a conical figure, and destroyed fifty-five cottages in the fall. Fifteen persons, together with about a hundred beasts, were also crushed beneath its ruins, which covered in extent a good league square. The dust it occasioned instantly covered all the neighbourhood in darkness. The heaps of rubbish were more than three hundred feet high. They stopped the current of a river that ran along the plain, which is now formed into several new and deep lakes. There appeared through the whole of this rubbish none of those substances that seemed to indicate that this disruption had been made by means of subterraneous fires. Most probably the base of this rocky mountain was rotted and decayed: and thus fell without any extraneous violence." In the same manner, in the year 1618, the town of Pleurs, in France, was buried beneath a rocky mountain, at the foot of which it was situated.[15]

These accidents, and many more that might be enumerated of the same kind, have been produced by various causes: by earthquakes, as in the mountain at Cajeta; or by being decayed at the bottom, as at Diableret. But the most general way is, by the foundation of one part of the mountain being hollowed by waters, and thus wanting a support, breaking from the other. Thus it generally has been found in the great chasms in the Alps; and thus it almost always is known in those disruptions of hills, which are known by the name of land-slips. These are nothing more than the slidings down of a higher piece of ground, disrooted from its situation by subterraneous inundations, and settling itself upon the plain below.

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[13] Buffon, vol. ii. p. 364.

[14] Hist. de l'Academie des Sciences, p. 4, An. 1715.

[15] On the 2d of September, 1806, an immense projection of the mountain of Rusfiberg in Switzerland gave way, and was precipitated into the valley of Lowertz. In four minutes it completely overwhelmed three villages, and part of two others. The torrent of earth and stones was more rapid than that of lava, and its effects as irresistible and terrible. The mountain, in its tremendous descent, carried trees, rocks, houses, and every thing before it. The mass spread in every direction, so as to bury, completely, a space of charming country, more than three miles square. The force of the earth was so great, that it not only overspread the hollow of the valley, but even ascended to a considerable height on the side of the opposite mountain. A portion of the falling mass rolled into the lake of Lowertz, and it has been calculated that a fifth part of it is filled up. This event was not caused by the fall of the summit of the mountain, but by an entire body of layers, which, from the base, up to the summit of Rusfiberg (being one hundred feet thick, one thousand feet wide, and nearly three miles in length), was separated from the lower layers, and slid parallel to their planes into the valley.—ED.

There is not an appearance in all nature that so much astonished our ancestors as these land-slips. In fact, to behold a large upland, with its houses, its corn, and cattle, at once loosened from its place, and floating, as it were, upon the subjacent water; to behold it quitting its ancient situation, and travelling forward like a ship in quest of new adventures; this is certainly one of the most extraordinary appearances that can be imagined; and to a people ignorant of the powers of nature, might well be considered as a prodigy. Accordingly, we find all our old historians mentioning it as an omen of approaching calamities. In this more enlightened age, however, its cause is very well known; and, instead of exciting ominous apprehensions in the populace, it only gives rise to some very ridiculous lawsuits among them, about whose the property shall be; whether the land which has thus slipt shall belong to the original possessor, or to him upon whose grounds it has encroached and settled. What has been the determination of the judges, is not so well known, but the circumstances of the slips have been minutely and exactly described.

In the lands of Slatberg,[16] in the kingdom of Iceland, there stood a declivity, gradually ascending for near half-a-mile. In the year 1713, and on the 10th of March, the inhabitants perceived a crack on its side, somewhat like a furrow made with a plough, which they imputed to the effects of lightning, as there had been thunder the night before. However, on the evening of the same day, they were surprised to hear a hideous confused noise issuing all round from the side of the hill; and their curiosity being raised, they resorted to the place. There, to their amazement, they found the earth, for near five acres, all in gentle motion, and sliding down the hill upon the subjacent plain. This motion continued the remaining part of the day, and the whole night; nor did the noise cease during the whole time; proceeding, probably, from the attrition of the ground beneath. The day following, however, this strange journey down the hill ceased entirely; and above an acre of the meadow below was found covered with what before composed a part of the declivity.

However, these slips, when a whole mountain's side seems to descend, happen but very rarely. There are some of another kind, however, much more common; and, as they are always sudden, much more dangerous. These are snow-slips, well known, and greatly dreaded by travellers. It often happens, that when snow has long been accumulated on the tops and on the sides of mountains, it is borne down the precipice, either by means of tempests, or its own melting. At first, when loosened, the volume in motion is but small, but gathers as it continues to roll; and by the time it has reached the habitable parts of the mountain, is generally grown of enormous bulk. Wherever it rolls it levels all things in its way, or buries them in unavoidable destruction. Instead of rolling, it sometimes is found to slide along from the top; yet even thus it is generally as fatal as before. Nevertheless, we have had an instance, a few years ago, of a small family in Germany, that lived for above a fortnight beneath one of these snow-slips. Although they were buried, during that whole time in utter darkness, and under a bed of some hundred feet deep, yet they were luckily taken out alive; the weight of the snow being supported by a beam that kept up the roof; and nourishment being supplied them by the milk of an ass, if I remember right, that was buried under the same ruin.

But it is not the parts, alone, that are thus found to subside; whole mountains have been known totally to disappear. Pliny[17] tells us, that in his own time, the lofty mountain of Cybotus, together with the city of Eurites, were swallowed by an earthquake. The same fate, he says, attended Phlegium, one of the highest mountains in Ethiopia; which, after one night's concussion, was never seen more. In more modern times, a very noted mountain in the Molucca islands, known by the name of the Peak, and remarkable for being seen at a very great distance from sea, was swallowed by an earthquake; and nothing but a lake was left in the place where it stood. Thus, while storms and tempests are levelled against mountains above, earthquakes and waters are undermining them below. All our histories talk of their destruction; and very few new ones (if we except Mount Cenere, and one or two such heaps of cinders) are produced. If mountains, therefore, were of such great utility as some philosophers make them to mankind, it would be a very melancholy consideration that such benefits were diminishing every day. But the truth is, the valleys are fertilized by that earth which is washed from their sides; and the plains become richer, in proportion as the mountains decay.

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[16] Phil. Trans. vol. iv. p. 250.

[17] Plin. lib. ii. cap. 93.

CHAP. XIII.

OF WATER.

IN contemplating nature, we shall often find the same substances possessed of contrary qualities, and producing opposite effects. Air which liquefies one substance, dries up another. That fire which is seen to burn up the desert, is often found in other places to assist the luxuriance of vegetation; and water which, next to fire, is the most fluid substance upon earth, nevertheless gives all other bodies their firmness and durability; so that every element seems to be a powerful servant, capable either of good or ill, and only awaiting external direction to become the friend or the enemy of mankind. These opposite qualities, in this substance in particular, have not failed to excite the admiration and inquiry of the curious.

That water is the most fluid penetrating body, next to fire, and the most difficult to confine, is incontestably proved by a variety of experiments. A vessel through which water cannot pass, may be said to retain anything. It may be objected indeed, that syrups, oils, and honey, leak through some vessels that water cannot pass through; but this is far from being the result of the greater tenuity and fineness of their parts; it is owing to the rosin wherewith the wood of such vessels abounds, which oils and syrups have a power of dissolving; so that these fluids, instead of finding their way, may more properly be said to eat their way, through the vessels that contain them. However, water will at last find its way even through these; for it is known to escape through vessels of every substance, glass only excepted. Other bodies may be found to make their way out more readily indeed; as air, when it finds a vent, will escape at once; and quicksilver, because of its weight, quickly penetrates through whatever chinky vessel confines it: but water, though it operates more slowly, yet always finds a more certain issue. As, for instance, it is well known that air will not pass through leather; which water will very readily penetrate. Air also may be retained in a bladder; but water will quickly ooze through. And those who drive this to the greatest degree of precision, pretend to say, that it will pass through pores ten times smaller than air can do. Be this as it may, we are very certain that its parts are so small, that they have been actually driven through the pores of gold. This has been proved by the famous Florentine experiment, in which a quantity of water was shut up in a hollow ball of gold, and when pressed with a huge force by screws, during which the fluid was seen to ooze through the pores of the metal, and to stand, like a dew, upon its surface.

As water is thus penetrating, and its parts thus minute, it may easily be supposed that they enter into the composition of all bodies, vegetable, animal, and fossil. This every chemist's experience convinces him of; and the mixture is the more obvious, as it can always be separated, by a gentle heat, from those substances with which it had been united. Fire, as was said, will penetrate where water cannot pass; but then it is not so easily to be separated. But there is scarce any substance from which water cannot be divorced. The parings or filings of lead, tin, and antimony, by distillation, yield water plentifully: the hardest stones, sea-salt, nitre, vitriol, and sulphur, are found to consist chiefly of water; into which they resolve by force of fire. "All birds, beasts, and fishes," says Newton, "insects, trees, and vegetables, with their parts, grow from water: and, by putrefaction, return to water again." In short, almost every substance that we see, owes its texture and firmness to the parts of water that mix with its earth; and, deprived of this fluid, it becomes a mass of shapeless dust and ashes.

From hence we see, as was above hinted, that this most fluid body, when mixed with others, gives them consistence and form. Water, by being mixed with earth or ashes, and formed into a vessel, when baked before the fire, becomes a coppel, remarkable for this, that it will bear the utmost force of the hottest furnace that art can contrive. So the Chinese earth, of which porcelain is made, is nothing more than an artificial composition of earth and water, united by heat; and which a greater degree of heat could easily separate. Thus we see a body extremely fluid of itself, in some measure assuming a new nature, by being united with others; we see a body, whose fluid and dissolving qualities are so obvious, giving consistence and hardness to all the substances of the earth.

From considerations of this kind, Thales, and many of the ancient philosophers, held that all things were made of water. In order to confirm this opinion, Helmont made an experiment, by divesting a quantity of earth of all its oils and salts, and then putting this earth, so prepared, into an earthen pot, which nothing but rain-water could enter, and planting a willow therein; this vegetable, so planted, grew up to a considerable height and bulk, merely from the accidental aspersion of rain-water; while the earth in which it was planted received no sensible diminution. From this experiment he concluded, that water was the only nourishment of the vegetable tribe; and that vegetables being the nourishment of animals, all organized substances, therefore, owed their support and being only to water. But this has been said by Woodward to be a mistake: for he shows, that water being impregnated with earthy particles, is only the conveyer of such substances into the pores of vegetables, rather than an increaser of them, by its own bulk: and likewise, that water is ever found to afford so much less nourishment, in proportion as it is purified by distillation. A plant in distilled water will not grow so fast as in water not distilled: and if the same be distilled three or four times over, the plant will scarce grow at all, or receive any nourishment from it. So that water, as such, does not seem the proper nourishment of vegetables, but only the vehicle thereof, which contains the nutritious particles, and carries them through all parts of the plant. Water, in its pure state, may suffice to extend or swell the parts of a plant, but affords vegetable matter in a moderate proportion.

However this be, it is agreed on all sides, that water, such as we find it, is far from being a pure simple substance.[1] The most genuine, we know, is mixed with exhalations and dissolutions of various kinds; and no expedient that has been hitherto discovered, is capable of purifying it entirely. If we filter and distil it a thousand times, according to Boerhaave, it will still depose a sediment: and by repeating the process, we may evaporate it entirely away, but can never totally remove its impurities. Some, however, assert, that water, properly distilled, will have no sediment;[2] and that the little white speck which is found at the bottom of the still, is a substance that enters from without. Kircher used to show, in his Museum, a phial of water that had been kept for fifty years, hermetically sealed;[3] during which it had deposed no sediment, but continued as transparent as when first put in. How far, therefore, it may be brought to a state of purity by distillation, is unknown; but we very well know, that all such water as we everywhere see, is a bed in which plants, minerals, and animals, are all found confusedly floating together.

Rain-water, which is a fluid of Nature's own distilling, and which has been raised so high by evaporation, is nevertheless a very mixed and impure substance. Exhalations of all kinds, whether salts, sulphurs, or metals, make a part of its substance, and tend to increase its weight. If we gather the water that falls, after a thunder-clap, in a sultry summer's day, and let it settle, we shall find a real salt sticking at the bottom. In winter, however, its impure mixtures are fewer, but still may be separated by distillation. But as to that which is generally caught pouring from the tops of houses, it is particularly foul, being impregnated with the smoke of the chimneys, the vapour of the slates or tiles, and with other impurities that birds and animals may have deposited there. Besides, though it should be supposed free from all these, it is mixed with a quantity of air, which, after being kept for some time, will be seen to separate.

Spring-water is next in point of purity. This, according to Dr. Halley, is collected from the air itself; which being sated with water, and coming to be condensed by the evening's cold, is driven against the tops of the mountains, where being condensed and collected, it trickles down by the sides, into the cavities of the earth; and running for a while underground, bubbles up in fountains upon the plain. This having made but a short circulation, has generally had no long time to dissolve or imbibe any foreign substances by the way.

River-water is generally more foul than the former.—Wherever the stream flows, it receives a tincture from its channel. Plants, minerals, and animals, all contribute to add to its impurities: so that such as live at the mouths of great rivers, are generally subject to all those disorders which contaminated and unwholesome waters are known to produce. Of all the river-water in the world, that of the Indus and the Thames is said to be the most light and wholesome.

The most impure fresh water that we know, is that of stagnating pools and lakes, which, in summer, may be more properly considered as a jelly of floating insects, than a collection of water.[4] In this, millions of little reptiles, undisturbed by any current, which might crush their frames to pieces, breed and engender. The whole teems with shapeless life, and only grows more fruitful by increasing putrefaction.

Of the purity of all these waters, the lightness, and not the transparency, ought to be the test. Water may be extremely clear and beautiful to the eye, and yet very much impregnated with mineral particles. In fact, sea-water is the most transparent of any, and yet it is well known to contain a large mixture of salt and bitumen. On the contrary, those waters which are lightest, have the fewest dissolutions floating in them; and may, therefore, be the most useful for all the purposes of life. But, after all, though much has been said upon this subject, and although waters have been weighed with great assiduity, to determine their degree of salubrity, yet neither this, nor their curdling with soap, nor any other philosophical standard whatsoever, will answer the purposes of true information. Experience alone ought to determine the useful or noxious qualities of every spring; and experience assures us, that different kinds of water are adapted to different constitutions. An incontestable proof of this, are the many medicinal springs throughout the world, whose peculiar benefits are known to the natives of their respective countries. These are of various kinds, according to the different minerals with which they are impregnated; hot, saline, sulphureous, bituminous, and oily.[5] But the account of these will come most properly under that of the several minerals by which they are produced.

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[1] Water has been ascertained to be a compound substance, and its constituents are clearly proved to be 85 parts of oxygen gas, and 15 of hydrogen by weight. M. Lavoisier has proved, that when 85 parts of oxygen gas are burned with 15 of hydrogen gas, 100 parts of water are formed; and if 100 parts of water are made to pass through a red hot iron tube, 15 parts of hydrogen gas will be procured, while the inside of the tube will be found converted into an oxyde, and to have gained 85 parts in weight.—Ed.

[2] Hill's History of Fossils.

[3] *Hermetically sealing* a glass vessel, means no more than heating the mouth of the phial red hot; and thus when the glass is become pliant, squeezing the mouth together with a pair of pincers, and then twisting it six or seven times round, which effectually closes it up.

[4] A quantity of charcoal thrown into putrid water renders the water sweet in a few hours.

After all, therefore, we must be contented with but an impure mixture for our daily beverage. And yet, perhaps, this very mixture may often be more serviceable to our health than that of a purer kind. We know that it is so with regard to vegetables: and why not, also, in general, to man? Be this as it will, if we are desirous of having water in its greatest purity, we are ordered, by the curious in this particular, to distil it from snow, gathered upon the tops of the highest mountains, and to take none but the outer and superficial part thereof. This we must be satisfied to call pure water; but even this is far short of the pure unmixed philosophical element; which, in reality, is nowhere to be found.

As water is thus mixed with foreign matter, and often the repository of minute animals, or vegetable seeds, we need not be surprised that, when carried to sea, it is always found to putrefy. But we must not suppose that it is the element itself which thus grows putrid and offensive, but the substances with which it is impregnated. It is true, the utmost precautions are taken to destroy all vegetable and animal substances that may have previously been lodged in it, by boiling; but, notwithstanding this, there are some that will still survive the operation, and others that find their way during the time of its stowage. Seamen, therefore, assure us, that their water is generally found to putrefy twice, at least, and sometimes three times, in a long voyage. In about a month after it has been at sea, when the bung is taken out of the cask, it sends up a noisome and dangerous vapour, which would take fire upon the application of a candle.[6] The whole body of the water then is found replete with little worm-like insects, that float, with great briskness, through all its parts. These generally live for about a couple of days; and then dying, by depositing their spoils, for a while increase the putrefaction. After a time, the heavier parts of these sinking to the bottom, the lighter float in a scum at the top; and this is what mariners call the water's purging itself. There is still, however, another race of insects, which are bred, very probably, from the spoils of the former; and produce, after some time, similar appearances: these dying, the water is then thought to change no more. However, it very often happens, especially in hot climates, that nothing can drive these nauseous insects from the ship's store of water. They often increase to a very disagreeable and frightful size, so as to deter the mariner, though parching with thirst, from tasting that cup which they have contaminated.

This water, as thus described, therefore, is a very different fluid from that simple elementary substance upon which philosophical theories have been founded; and concerning the nature of which there have been so many disputes. Elementary water is no way compounded; but is without taste, smell, or colour; and incapable of being discerned by any of the senses, except the touch. This is the famous dissolvent of the chemists, into which, as they have boasted, they can reduce all bodies; and which makes up all other substances, only by putting on a different disguise. In some forms it is fluid, transparent, and evasive of the touch; in others, hard, firm, and elastic. In some, it is stiffened by cold; in others dissolved by fire. According to them, it only assumes external shapes from accidental causes; but the mountain is as much a body of water as the cake of ice that melts on its brow; and even the philosopher himself is composed of the same materials with the cloud or meteor which he contemplates.

Speculation seldom rests when it begins. Others, disallowing the universality of this substance, will not allow that in a state of nature there is any such thing as water at all. "What assumes the appearance," say they, "is nothing more than melted ice. Ice is the real element of Nature's making; and when found in a state of fluidity, it is then in a state of violence. All substances are naturally hard; but some more readily melt with heat than others. It requires a great heat to melt iron; a smaller heat will melt copper; silver, gold, tin, and lead, melt with smaller still; ice, which is a body like the rest, melts with a very moderate warmth; and quicksilver melts with the smallest warmth of all. Water, therefore, is but ice kept in continual fusion; and still returning to its former state when the heat is taken away." Between these opposite opinions, the controversy has been carried on with great ardour, and much has been written on both sides; and yet when we come to examine the debate, it will probably terminate in this question, whether cold or heat first began their operations upon water? This is a fact of very little importance, if known; and, what is more, it is a fact we can never know.

Indeed, if we examine into the operations of cold and heat upon water, we shall find that they produce somewhat similar effects. Water dilates in its bulk, by heat, to a very considerable degree; and, what is more extraordinary, it is likewise dilated by cold in the same manner.

If water be placed over a fire, it grows gradually larger in bulk, as it becomes hot, until it begins to boil; after which no art can either increase its bulk or its heat. By increasing the fire, indeed, it may be more quickly evaporated away; but its heat and its bulk still continue the same. By the expanding of this fluid by heat, philosophers have found a way to determine the warmth or the coldness of other bodies; for if put into a glass tube, by its swelling and rising, it shows the quantity of heat in the body to which it is applied; and by its contracting and sinking, it shows the absence of the same. Instead of using water in this instrument, which is called a thermometer, they now make use of spirit of wine, which is not apt to freeze, and which is endued even with a greater expansion, by heat, than water.[7] The instrument consists of nothing more than a hollow ball of glass, with a long tube growing out of it. This being partly filled with spirits of wine tinctured red, so as to be seen when it rises, the ball is plunged into boiling water, which making the spirit within expand and rise in the tube, the water marks the greatest height to which it ascends; at this point the tube is to be broken off, and then hermetically sealed, by melting the glass with a blow-pipe: a scale being place by the side, completes the thermometer. Now as the fluid expands or condenses with heat or cold, it will rise and fall in the tube in proportion; and the degree or quantity of ascent or descent will be seen in the scale.

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[5] See Supplementary Note A, p. 118.

[6] Phil. Trans. vol. v. part ii. p. 71.

No fire, as was said, can make water hotter, after it begins to boil. We can, therefore, at any time be sure of an equable certain heat; which is that of boiling water, which is invariably the same. The certainty of such a heat is not less useful than the instrument that measures it. It affords a standard, fixed degree of heat over the whole world; boiling water being as hot in Greenland as upon the coast of Guinea. One fire is more intense than another; of heat there are various degrees; but boiling water is a heat everywhere the same, and easily procurable.

As heat thus expands water, so cold, when it is violent enough to freeze the same, produces exactly the same effect, and expands it likewise. Thus water is acted upon in the same manner by two opposite qualities; being dilated by both. As a proof that it is dilated by cold, we have only to observe the ice floating on the surface of a pond, which it would not do were it not dilated, and grown more bulky, by freezing, than the water which remains unfroze. Mr. Boyle, however, put the matter past a doubt, by a variety of experiments.[8] Having poured a proper quantity of water into a strong earthen vessel, he exposed it, uncovered, to the open air, in frosty nights; and observed, that continually the ice reached higher than the water before it was frozen. He filled also a tube with water, and stopped both ends with wax: the water, when frozen, was found to push out the stopples from both ends; and a rod of ice appeared at each end of the tube, which showed how much it was swollen by the cold within.

From hence, therefore, we may be very certain of the cold's dilating of the water; and experience also shows, that the force of this expansion has been found as great as any which heat has been found to produce. The touch-hole of a strong gun-barrel being stopped, and a plug of iron forcibly driven into the muzzle, after the barrel had been filled with water, it was placed in a mixture of ice and salt; the plug, though soldered to the barrel, at first give way, but being fixed in more firmly, within a quarter of an hour the gun-barrel burst with a loud noise, and blew up the cover of the box wherein it lay. Such is its force in an ordinary experiment. But it has been known to burst cannons, filled with water, and then left to freeze; for the cold congealing the water, and the ice swelling, it became irresistible. The bursting of rocks by frost, which is frequent in the northern climates, and is sometimes seen in our own, is an equal proof of the expansion of congealed water. For having by some means insinuated itself into the body of the rock, it has remained there till the cold was sufficient to affect it by congelation. But when once frozen, no obstacle is able to confine it from dilating; and, if it cannot otherwise find room, the rock must burst asunder.

This alteration in the bulk of water might have served as a proof that it was capable of being compressed into a narrower space than it occupied before; but, till of late, water was held to be incompressible. The general opinion was, that no art whatsoever could squeeze it into a narrower compass; that no power on earth, for instance, could force a pint of water into a vessel that held an hair's-breath less than a pint. And this, said they, appears from the famous Florentine experiment; where the water, rather than suffer compressure, was seen to ooze through the pores of the solid metal; and, at length, making a cleft in the side, spun out with great vehemence. But later trials have proved that water is very compressible, and partakes of that elasticity which every other body possesses in some degree. Indeed, had not mankind been dazzled by the brilliancy of one inconclusive experiment, there were numerous reasons to convince them of its having the same properties with other substances. Ice, which is water in another state, is very elastic. A stone, flung slantingly along the surface of a pond, bounds from the water several times; which shows it to be elastic also. But the trials of Mr. Canton have put this past all doubt; which being somewhat similar to those of the great Boyle, who pressed it with weights properly applied, carry sufficient conviction.[9]

What has been hitherto related, is chiefly applicable to the element of water alone; but its fluidity is a property that it possesses in common with several other substances, in other respects greatly differing from it. That quality which gives rise to the definition of a fluid, namely, that its parts are in a continual intestine motion, seems extremely applicable to water. What the shapes of those parts are, it would be vain to attempt to discover. Every trial only shows the futility of the attempt; all we find is, that they are extremely minute; and that they roll over each other with the greatest ease. Some, indeed, from this property alone, have not hesitated to pronounce them globular; and we have, in all our hydrostatic books, pictures of these little globes in a state of sliding and rolling over each other. But all this is merely the work of imagination; we know that substances of any kind, reduced very small, assume a fluid appearance, somewhat resembling that of water. Mr. Boyle, after finely powdering and sifting a little dry powder of plaster of Paris, put it in a vessel over the fire, where it soon began to boil like water, exhibiting all the motions and appearances of a boiling liquor. Although but a powder, the parts of which we know are very different from each other, and just as accident has formed them, yet it heaved in great waves like water. Upon agitation, a heavy body will sink to the bottom, and a light one emerge to the top. There is no reason, then, to suppose the figure of the parts of water round, since we see their fluidity very well imitated by a composition, the parts of which are of various forms and sizes. The shape of the parts of water, therefore, we must be content to continue ignorant of. All we know is, that earth, air, and fire, conduce to separate the parts from each other.

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[7] See Supplementary Note B, p. 119.

[8] Boyle, vol. i. p. 610.

[9] See Supplementary Note C, p. 119.

Earthy substances divide the parts from each other, and keep them asunder. This division may be so great, that the water will entirely lose its fluidity thereby. Mud, potter's clay, and dried bricks, are but so many different combinations of earth and water; each substance in which the parts of water are most separated from each other, appearing to be the most dry. In some substances, indeed, where the parts of water are greatly divided, as in porcelain, for instance, it is no easy matter to recover and bring them together again; but they continue in a manner fixed and united to the manufactured clay. This circumstance led Doctor Cheney into a very peculiar train of thinking. He suspected that the quantity of water, on the surface of the earth, was daily decreasing. For, says he, some parts of it are continually joined to vegetable, animal, and mineral substances, which no art can again recover. United with these, the water loses its fluidity; for if, continues he, we separate a few particles of any fluid and fasten them to a solid body, or keep them asunder, they will be fluid no longer. To produce fluidity, a considerable number of such particles are required; but here they are close and destitute of their natural properties. Thus, according to him, the world is growing every day harder and harder, and the earth firmer and firmer; and there may come a time when every object around us may be stiffened in universal frigidity! However, we have causes enough of anxiety in this world already, not to add this preposterous concern to the number.

That air also contributes to divide the parts of water, we can have no manner of doubt; some have even disputed whether water be not capable of being turned into air. However, though this cannot be allowed, it must be granted, that it may be turned into a substance which greatly resembles air (as we have seen in the experiment of the æolipile) with all its properties; except that, by cold, this new-made air may be condensed again into water.

But of all the substances which tend to divide the parts of water, fire is the most powerful. Water, when heated into steam, acquires such force, and the parts of it tend to fly off from each other with such violence, that no earthly substance we know of is strong enough to confine them. A single drop of water, converted into steam, has been found capable of raising a weight of twenty tons; and would have raised twenty thousand, were the vessel confining it sufficiently strong, and the fire below increased in proportion.

From this easy yielding of its parts to external pressure, arises the art of determining the specific gravity of bodies by plunging them in water; with many other useful discoveries in that part of natural philosophy, called *hydrostatics*. The laws of this science which Archimedes began, and Pascal, with some other of the moderns, have improved, rather belongs to experimental than to natural history. However, I will take leave to mention some of the most striking paradoxes in this branch of science, which are as well confirmed by experiment, as rendered universal by theory. It would, indeed, be unpardonable, while discoursing on the properties of water, to omit giving some account of the manner in which it sustains such immense bulks, as we see floating upon its soft and yielding surface; how some bodies, that are known to sink at one time, swim with ease, if their surface be enlarged; how the heaviest body, even gold itself, may be made to swim upon water; and how the lightest, such as cork, shall remain sunk at the bottom; how the pouring in of a single quart of water will burst a hogshead hooped with iron; and how it ascends, in pipes, from the valley, to travel over the mountain; these are circumstances that are at first surprising; but, upon a slight consideration, lose their wonder.

[10] In order to conceive the manner in which all these wonders are effected, we must begin by ob-

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[10] In the above sketch, the manner of demonstrating used by Monsieur D'Alembert is made use of, as the most obvious, and the most satisfactory. Vide Essai sur, &c.

serving that water is possessed of an invariable property, which has not hitherto been mentioned, that of always keeping its surface level and even. Winds, indeed, may raise it into waves, or art spurt it up in fountains; but ever, when left to itself, it sinks into a smooth even surface, of which no one part is higher than another. If I should pour water, for instance, into the arm of a pipe of the shape of the letter U, the fluid would rise in the other arm just to the same height; because, otherwise, it would not find its level, which it invariably maintains. A pipe bending from one hill down into the valley, and rising by another, may be considered as a tube of this kind, in which the water, sinking in one arm, rises to maintain its level in the other. Upon this principle all water-pipes depend; which can never raise the water higher than the fountain from which they proceed.

Again, let us suppose for a moment, that the arms of the pipe already mentioned may be made long or short at pleasure; and let us still further suppose, that there is some obstacle at the bottom of it, which prevents the water poured into one arm, from rising in the other. Now it is evident, that this obstacle at the bottom will sustain a pressure from the water in one arm, equal to what would make it rise in the other; and this pressure will be great, in proportion as the arm filled with water is tall. We may, therefore, generally conclude, that the bottom of every vessel is pressed by a force, in proportion to the height of the water in that vessel. For instance, if the vessel filled with water be forty feet high, the bottom of that vessel will sustain such a pressure as would raise the same water forty feet high, which is very great. From hence we see how extremely apt our pipes, that convey water to the city, are to burst: for descending from a hill of more than forty feet high, they are pressed by the water contained in them, with a force equal to what would raise it more than forty feet high; and that this is sometimes able to burst a wooden pipe, we can have no room to doubt of.

Still recurring to our pipe, let us suppose one of its arms ten times as thick as the other; this will produce no effect whatsoever upon the obstacle below, which we supposed hindering its rise in the arm; because, how thick soever the pipe may be, its contents will only rise to its own level; and it will, therefore, press the obstacle with a force equal thereto. We may, therefore, universally conclude, that the bottom of any vessel is pressed by its water, not as it is broad or narrow, but in proportion as it is high. Thus the water contained in a vessel not thicker than my finger, presses its bottom as forcibly as the water contained in a hogshead of an equal height; and, if we made holes in the bottoms of both, the water would burst out as forceful from the one as the other. Hence we may, with great ease, burst a hogshead with a single quart of water; and it has been often done. We have only, for this, to place a hogshead on one end, filled with water: we then bore a hole in its top, into which we plant a narrow tin pipe, of about thirty feet high: by pouring a quart of water into this, at the top, as it continues to rise higher in the pipe, it will press more forcibly on the bottom and sides of the hogshead below, and at last burst it.[11]

Still returning to our simple instrument of demonstration. If we suppose the obstacle at the bottom of the pipe to be moveable, so as that the force of the water can push it up into the other arm; such a body as quicksilver, for instance. Now, it is evident, that the weight of water weighing down upon this quicksilver in one arm, will at last press it up in the other arm; and will continue to press it upwards, until the fluid in both arms be upon a par. So that here we actually see quicksilver, the heaviest substance in the world except gold and platina, floating upon water, which is but a very light substance.

When we see water thus capable of sustaining quicksilver, we need not be surprised that it is capable of floating much lighter substances, ships, animals, or timber. When any thing floats upon water, we always see that a part of it sinks in the same. A cork, a ship, a buoy, each buries itself in a bed on the surface of the water; this bed may be considered as so much water displaced; the water will, therefore, lose so much of its own weight, as is equal to the weight of that bed of water which it displaces. If the body be heavier than a similar bulk of water, it will sink; if lighter, it will swim. Universally, therefore, a body plunged in water, loses as much of its weight as is equal to the weight of a body of water of its own bulk. Some light bodies, therefore, such as cork, lose much of their weight, and therefore swim; other more ponderous bodies sink, because they are heavier than their bulk of water.

Upon this simple theorem entirely depends the art of weighing metals hydrostatically. I have a guinea, for instance, and desire to know whether it be pure gold; I have weighed it in the usual way with another guinea, and find it exactly of the same weight, but still I have some suspicion, from its greater bulk, that it is not pure. In order to determine this, I have nothing more to do than to weigh it in water with that same guinea that I know to be good, and of the same weight; and this will instantly show the difference; for the true ponderous metal will sink, and the false bulky one will be sustained in proportion to the greatness of its surface. Those whose business it is to examine the purity of metals, have a balance made for this purpose, by which they can precisely determine which is most ponderous, or, as it is expressed, which has the greatest specific gravity. Seventy-one pound and a-half of quicksilver, is found to be equal in bulk to a hundred pound weight of gold. In the same proportion sixty of lead, fifty-four of silver, forty-seven of copper, forty-five of brass, forty-two of iron, and thirty-nine of tin, are each equal to a hundred pound of the most ponderous of all metals.

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[11] Nollet's Lectures.

This method of precisely determining the purity of gold, by weighing in water, was first discovered by Archimedes, to whom mankind have been indebted for many useful discoveries. Hiero, king of Sicily, having sent a certain quantity of gold to be made into a crown, the workman, it seems, kept a part for his own use, and supplied the deficiency with a baser metal. His fraud was suspected by the king, but could not be detected till he applied to Archimedes, who weighed the crown in water; and by this method, informed the king of the quantity of gold which was taken away.

It has been said, that all fluids endeavour to preserve their level; and, likewise, that a body pressing on the surface, tended to destroy that level. From hence, it will easily be inferred, that the deeper any body sinks, the greater will be the resistance of the depressed fluid beneath. It will be asked, therefore, as the resistance increases in proportion as the body descends, how comes the body, after it has got a certain way, to sink at all? The answer is obvious: From the fluid above pressing it down with almost as great a force as the fluid beneath presses it up. Take away, by any art, the pressure of the fluid from above, and let only the resistance of the fluid from below be suffered to act, and after the body is got down very deep, the resistance will be insuperable. To give an instance: A small hole opens in the bottom of a ship at sea, forty feet, we will suppose, below the surface of the water; through this the water bursts up with great violence; I attempt to stop it with my hand, but it pushes the hand violently away. Here the hand is, in fact, a body attempting to sink upon water, at a depth of forty feet, with the pressure from above taken away. The water, therefore, will overcome my strength; and will continue to burst in till it has got to its level: if I should then dive into the hold, and clap my hand upon the opening, as before, I should perceive no force acting against my hand at all; for the water above presses the hand as much down against the hole, as the water without presses it upward. For this reason, also, when we dive to the bottom of the water, we sustain a very great pressure from above, it is true, but it is counteracted by the pressure from below; and the whole acting uniformly on the surface of the body, wraps us close round without injury.

As I have deviated thus far, I will just mention one or two properties more, which water, and all such like fluids, is found to possess. And, first, their ascending in vessels which are emptied of air, as in our common pumps for instance. The air, however, being the agent in this case, we must previously examine its properties, before we undertake the explanation. The other property to be mentioned is, that of their ascending in small capillary tubes. This is one of the most extraordinary and inscrutable appearances in nature. Glass tubes may be drawn, by means of a lamp, as fine as a hair; still preserving their hollow within. If one of these be planted in a vessel of water, or spirit of wine, the liquor will immediately be seen to ascend; and it will rise higher, in proportion as the tube is smaller; a foot, two feet, and more. How does this come to pass? Is the air the cause? No: the liquor rises, although the air be taken away. Is attraction the cause? No: for quicksilver does not ascend, which it otherwise would. Many have been the theories of experimental philosophers to explain this property. Such as are fond of travelling in the regions of conjecture, may consult Hawksbee, Morgan, Jurin, or Watson, who have examined the subject with great minuteness. Hitherto, however, nothing but doubts, instead of knowledge, have been the result of their inquiries. It will not, therefore, become us to enter into the minuteness of the inquiry, when we have so many greater wonders to call our attention away.[12]

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[12] This phenomenon, which has so long embarrassed philosophers, is easily soluble upon the principle, that the attraction between the particles of glass and water is greater than the attraction between the particles of water themselves: for, if a glass tube be held parallel to the horizon, and a drop of water be applied to the under side of the tube, it will adhere to it: nor will it fall from the glass, till its bulk and gravity are so far increased as to overbalance the attraction of the glass. Hence it is easy to conceive, how sensibly such a power must act on the surface of a fluid not viscid, as water, contained within the cavity of a small glass tube; as also that the quantity of the fluid raised, will be as the surface of the bore which it fills, that is, as the diameter of the tube.—Ed.

Note A.—*Mineral Springs.*

Mineral waters are divided into four classes; the acidulous, the sulphureous, the chalybeate, and the saline.

Acidulous waters are those which contain carbonic acid in its free state, or in combination in excess with a base. These waters are easily distinguished by their slightly acid taste, and by their sparkling when poured from one vessel to another; both of which properties they lose, when exposed to the air for a length of time, or by boiling. Besides carbonic acid, they almost always contain muriate of soda, and some of the earthy carbonates; it is the free carbonic acid, however, that imparts to them their particular properties.

Sulphureous waters are those which contain sulphuretted hydrogen. These are very easily distinguished by their odour, and by their rendering a solution of a salt of lead black, or by causing a piece of silver, when immersed in them, to acquire a dark colour. Besides sulphuretted hydrogen, they in general contain alkaline and earthy sulphates and muriates. The sulphureous waters may be subdivided into two kinds: 1st, Those which have sulphuretted hydrogen in its free state; 2d, Those in which it exists in union with an alkali or an earth.

Chalybeate waters are those which have iron as an ingredient. These are known by their peculiar taste, and by their becoming black when mixed with an infusion of nutgalls. The chalybeate waters are of different kinds; sometimes the iron is combined with sulphuric acid, more frequently it is in union with carbonic acid; this may be just in sufficient quantity to hold the iron in solution, or it may be in excess, in which case, besides chalybeate, the water possesses acid properties, forming what is called an acidulous chalybeate water.

Saline waters are those which contain the saline ingredients generally found in mineral waters, but which have not carbonic acid in excess, and are free from sulphuretted hydrogen and iron, or contain them in very trifling quantity. Saline waters may be subdivided into four kinds, viz.:—Alkaline waters, or those which contain alkali in its free state, or combined with carbonic acid, and which render the vegetable blues green. Hard waters, or those which contain carbonate or sulphate of lime. Salt waters, or those in which muriate of soda abounds. Purgative waters, or those which contain principally sulphate of magnesia.

Hot springs are most frequent in volcanic regions. No satisfactory explanation of the temperature of these springs, and, above all, of their wonderful equability in this respect, for a very long series of years, has ever been offered. When they are connected with volcanoes, we naturally ascribe the temperature of the spring to the heat of the volcano; but when they occur at a considerable distance from volcanic countries, such an explanation cannot be applied. Thus the hot spring at Bath has continued at a temperature higher than that of the air, for a period not less than 2,000 years; yet it is so far from any volcano, that we cannot, without a very violent and improbable extension of volcanic fires, ascribe it to their energy. There are various decompositions of mineral bodies, which generate considerable heat. These decompositions are generally brought about by means of water; or to speak more properly, water is itself the substance which is decomposed, and which generates heat by its decomposition. Thus, for example, there are varieties of pyrites, which are converted into sulphate of iron by the contact of water, and such a change is accompanied by an evolution of heat. Were we to suppose the Bath spring to flow through a bed of such pyrites, its heat might be occasioned by such a decomposition. Such probably is the way in which those springs, that contain sulphurated hydrogen gas, received their impregnation. But we are pretty certain, that such a supposition will not apply to Bath water: first, because it does not contain the notable quantity of sulphate, or iron, which would be necessary upon such a supposition; and, secondly, because instead of sulphurated hydrogen gas, which would infallibly result from such a decomposition of pyrites, there is an evolution of azotic gas. This evolution of azotic gas, however, is a decisive proof that the heat of Bath water is owing to some decomposition or other which takes place within the surface of the earth; though from our imperfect acquaintance with the nature of mineral strata, through which the water flows, we cannot give any satisfactory information about what that decomposition actually is. In the island of St. Miguel, one of the Azores, which exhibits very obvious marks of having abounded in volcanoes, there are a considerable number of hot springs of various temperatures; some boiling hot, others cooler, and some so low that they are used as baths, and have acquired great celebrity for the wonderful cures they have performed. Mr. Masson informs us, that these springs are surrounded with abundance of native sulphur, which, he affirms, is exhaled by them in abundance—a circumstance which renders it probable, that the heat of these springs depends upon the decomposition of pyrites. In the island of Amsterdam there are several hot springs; in one of them was immersed Fahrenheit's thermometer, which in the air stood at sixty-two degrees, and it ascended immediately to 196°. In another it rose to 204°; and the bulb of the thermometer being applied to a crevice, ascended in less than a minute to the boiling point. Some fish being caught and put into the spring, were boiled fit for eating in 15 minutes. In the island of Iceland there are many hot springs, and several magnificent spouting springs, which are called *geysers*.

Note B.—*Thermometers.*

Mercury expands by heat and contracts by cold with greater uniformity than even spirit of wine: it is therefore the most proper and the most commonly used for thermometers. There are four different thermometers used at present in Europe; these are, Fahrenheit's, Celsius's, Reaumur's, and De Lisle's. Fahrenheit's thermometer is used in Britain. The space between the boiling and freezing points is divided into 180°; but the scale begins at the temperature produced by mixing together snow and common salt, which is 32° below the freezing point; of course the freezing point is marked 32°, and the boiling point 212°.

The thermometer of Celsius is used in Sweden; it has been used also in France since the first revolution, under the name of the *thermometre centigrade.* In it the space between the freezing and boiling points is divided into 100°. The freezing point is marked 0, the boiling point 100°.

The thermometer known by the name of *Reaumur*, which was in fact constructed by De Luc, was used in France before the revolution, and is still used in Italy and Spain. In it the space between the boiling and freezing points is divided into 80°. The freezing point is marked 0, the boiling point 80°.

De Lisle's thermometer is used in Russia. The space between the boiling and freezing points is divided into 150°; but the gradation begins at the boiling point, and increases towards the freezing point. The boiling point is marked 0, and the freezing point 150°.

The temperatures which we can measure by a mercurial thermometer are confined within narrow limits. For mercury freezes at about 39° below zero, and boils at 660°. Hence we cannot employ it to measure greater heats than 660°, nor greater degrees of cold than 39°. Yet many temperatures connected with our most common processes are much higher than 660°. The heat of a common fire, the temperature at which silver, copper, and gold melts, and many other such points, offer familiar examples. —See Dr. Thomson's 'Outline of the Science of Heat and Electricity,' 1830, 8vo.

Note C.—*Compressibility of Water.*

With the barometer at 29½, and thermemoter at 50, Canton declares the following to be the results he obtained:

Compression of	spirit of wine,	66	parts in a million,
...	Oil of olives,	48	...
...	Rain-water,	46	...
...	Sea-water,	40	...
...	Mercury,	3	...

These results he obtained in the following manner: He took a glass tube about two feet long, with a ball at one end, of an inch and a quarter in diameter; he filled the ball, and part of the tube, with water which had previously been deprived of air as much as possible; he then placed it under the receiver of an air-pump, and removed from it the pressure of the atmosphere; under this treatment he observed that the water rose a little way in the tube. On the contrary, when he placed the apparatus upon a condensing engine, and by condensing the air in the receiver, increased the pressure upon the water, he observed that the water descended a little way in the tube. In this manner he found that water expanded one part in 21,740 when the pressure of the atmosphere was removed, and submitted to a compression of one part in 10,870 under the weight of a double atmosphere. He also observed that water possessed the remarkable property of being more compressible in winter than in summer; contrary to the effect on spirit of wine and oil of olives. Lest it might be supposed that the compressibility thus discovered might be owing to air lodged within the fluids employed, a quantity of water was caused to imbibe more air than it contained in a preceding trial; but its compressibility was not increased. These experiments, although upon the whole so apparently decisive of the questions they were instituted to determine, are yet not to be received without some caution; and in particular, the remark that the addition of a portion of so compressible a fluid as air, did not render water more compressible than before, is rather staggering, and is calculated to throw the veil of doubt over all the rest. It remains therefore, for future investigation to fix the judgment of philosophers on this subject; in the meantime, even granting all the compressibility that has been contended for, the quantity of it is too small to be noticed in practice. Persons at sea frequently try an experiment which proves, in a great degree, the incompressibility of water. Having corked a bottle containing only air, and therefore called empty, they tie a rope to it, and sink it to a considerable depth by a sufficient weight; on pulling up the bottle, they generally find it either broken, or the cork forced in: but on sinking to the same or even any greater depth, a bottle filled with water, they find it, when drawn up, to be uninjured, because the water resists compression, and therefore supports the bottle; which support, under the pressure at a great depth, the air cannot supply.

CHAP. XIV.

OF THE ORIGIN OF RIVERS.

"THE sun ariseth, and the sun goeth down, and pants for the place from whence he arose. All things are filled with labour, and man cannot utter it. All rivers run into the sea, yet the sea is not full. Unto the place whence the rivers come, thither they return again. The eye is not satisfied with seeing, nor the ear with hearing."[1] Thus speaks the wisest of the Jews. And at so early a period was the curiosity of man employed in observing these great circulations of nature. Every eye attempted to explain those appearances; and every philosopher who has long thought upon the subject, seems to give a peculiar solution. The inquiry whence rivers are produced; whence they derive those unceasing stores of water which continually enrich the world with fertility and verdure; has been variously considered, and divided the opinions of mankind more than any other topic in natural history.

In this contest the various champions may be classed under two leaders; Mr. De la Hire, who contends that rivers must be supplied from the sea, strained through the pores of the earth; and Dr. Halley, who has endeavoured to demonstrate that the clouds alone are sufficient for the supply. Both sides have brought in mathematics to their aid; and have shown that long and laborious calculations can at any time be made to obscure both sides of a question.

De la Hire[2] begins his proofs, that rain-water, evaporated from the sea, is insufficient for the production of rivers: by showing that rain never penetrates the surface of the earth above sixteen inches. From thence he infers, that it is impossible for it in many cases, to sink so as to be found at such considerable depths below. Rain-water, he grants, is often seen to mix with rivers, and to swell their currents; but a much greater part of it evaporates. "In fact," continues he, "if we suppose the earth everywhere covered with water, evaporation alone would be sufficient to carry off two feet nine inches of it in a year: and yet we very well know, that scarcely nineteen inches of rain-water fall in that time: so that evaporation would carry off a much greater quantity than is ever known to descend. The small quantity of rain-water that falls is, therefore, but barely sufficient for the purposes of vegetation. Two leaves of a fig-tree have been found, by experiment, to imbibe from the earth, in five hours and a half, two ounces of water. This implies the great quantity of fluid that must be exhausted in the maintenance of one single plant. Add to this, that the waters of the river Rungis will, by calculation, rise to fifty inches; and the whole country from whence they are supplied never receives fifty inches in the year by rain. Besides this, there are many salt springs, which are known to proceed immediately from the sea, and are subject to its flux and reflux. In short, wherever we dig beneath the surface of the earth, except in a very few instances, water is to be found; and it is by this subterraneous water that springs and rivers, nay, a great part of vegetation itself, is supported. It is this subterraneous water which is raised into steam, by the internal heat of the earth, that feeds plants. It is this subterraneous water that distils through its interstices; and there, cooling, forms fountains. It is this that, by the addition of rains, is increased into rivers, and pours plenty over the whole earth."

On the other side of the question,[3] it is asserted, that the vapours which are exhaled from the sea, and driven by the winds upon land, are more than sufficient to supply not only plants with moisture, but also to furnish a sufficiency of water to the greatest rivers. For this purpose, an estimate has been made of the quantity of water emptied at the mouths of the greatest rivers; and of the quantity also raised from the sea by evaporation; and it has been found, that the latter by far exceeds the former. This calculation was made by Mr. Marriotte. By him it was found, upon receiving such rain as fell in a year, in a proper vessel fitted for that purpose, that one year with another, there might fall about twenty inches of water upon the surface of the earth, throughout Europe. It was also computed that the river Seine, from its source to the city of Paris, might cover an extent of ground, that would supply it annually with above seven millions of cubic feet of this water, formed by evaporation. But upon computing the quantity which passed through the arches of one of its bridges in a year it was found to amount only to two hundred and eighty millions of cubic feet, which is not above the sixth part of the former number. Hence it appears, that this river may receive a supply, brought to it by the evaporated waters of the sea, six times greater than what it gives back to the sea by its current; and, therefore, evaporation is more than sufficient for maintaining the greatest rivers, and supplying the purposes also of vegetation.[4]

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[1] Ecclesiastes, chap. i. ver. 5, 7, 8.

[2] Hist. de l'Acad. 1713, p. 56.

[3] Phil. Trans. vol. ii. p. 128.

In this manner, the sea supplies sufficient humidity to the air, for furnishing the earth with all necessary moisture. One part of its vapours falls upon its own bosom, before it arrives upon land. Another part is arrested by the sides of mountains, and is compelled, by the rising stream of air, to mount upward towards the summits. Here it is presently precipitated, dripping down by the crannies of the stone. In some places, entering into the caverns of the mountain, it gathers in those receptacles, which being once filled, all the rest overflows; and breaking out by the sides of the hills, forms single springs. Many of these run down by the valleys or guts between the ridges of the mountain, and, coming to unite, form little rivulets or brooks; many of these meeting in one common valley, and gaining the plain ground, being grown less rapid, become a river; and many of these uniting, make such vast bodies of water as the Rhine, the Rhone, and the Danube.

There is still a third part which falls upon the lower grounds, and furnishes plants with their wonted supply. But the circulation does not rest even here; for it is again exhaled into vapour by the action of the sun; and afterwards returned to that great mass of waters whence it first arose. "This," adds Dr. Halley, "seems the most reasonable hypothesis: and much more likely to be true, than that of those who derive all springs from the filtering of the sea-waters, through certain imaginary tubes or passages within the earth; since it is well-known that the greatest rivers have their most copious fountains the most remote from the sea."[5]

This seems the most general opinion; and yet, after all, it is still pressed with great difficulties; and there is still room to look out for a better theory. The perpetuity of many springs, which always yield the same quantity, when the least rain or vapour is afforded, as well as when the greatest, is a strong objection. Derham[6] mentions a spring at Upminster, which he could never perceive by his eye to be diminished in the greatest droughts, even when all the ponds in the country, as well as an adjoining brook, have been dry for several months together. In the rainy seasons, also, it was never overflowed; except sometimes, perhaps, for an hour or so, upon the immission of the external rains. He, therefore, justly enough concludes, that had this spring its origin from rain or vapour, there would be found an increase or decrease of its water, corresponding to the causes of its production.

Thus the reader, after having been tossed from one hypothesis to another, must at last be content to settle in conscious ignorance. All that has been written upon this subject, affords him rather something to say, than something to think; something rather for others than for himself. Varenius, indeed, although he is at a loss for the origin of rivers, is by no means so as to their formation. He is pretty positive that all rivers are artificial. He boldly asserts that their channels have been originally formed by the industry of man. His reasons are, that when a new spring breaks forth, the water does not make itself a new channel, but spreads over the adjacent land. "Thus," says he, "men are obliged to direct its course; or, otherwise, Nature would never have found one." He enumerates many rivers that are certainly known, from history, to have been dug by men. He alleges, that no salt-water rivers are found, because men did not want salt-water; and as for salt, that was procurable at less expense than digging a river for it. However, it costs a speculative man but a small expense of thinking to form such an hypothesis. It may perhaps engross the reader's patience to detain him longer upon it.

Nevertheless, though philosophy be thus ignorant as to the production of rivers, yet the laws of their motion, and the nature of their currents, have been very well explained. The Italians have particularly distinguished themselves in this respect; and it is chiefly to them that we are indebted for the improvement.[7]

All rivers have their source either in mountains or elevated lakes; and it is in their descent from these that they acquire that velocity which maintains their future current. At first their course is generally rapid and headlong; but it is retarded in its journey, by the continual friction against its banks, by the many obstacles it meets to divert its stream, and by the plains generally becoming more level as it approaches towards the sea.

If this acquired velocity be quite spent, and the plain through which the river passes is entirely level; it will, notwithstanding, still continue to run from the perpendicular pressure of the water, which is always in exact proportion to the depth. This perpendicular pressure is nothing more than the weight of the upper waters pressing the lower out of their places; and consequently driving them forward, as they cannot recede against the stream. As this pressure is greatest in the deepest parts of the river, so we generally find the middle of the stream most rapid; both because it has the greatest motion thus communicated by the pressure, and the fewest obstructions from the banks on either side.[8]

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[4] See Supplementary Note A, p. 127.

[5] Phil. Trans. vol. ii. p. 128.

[6] Derham Physico-Theol.

[7] S. Guglielmini della Natura de Fiumi, *passim*.

Rivers thus set into motion are almost always found to make their own beds. Where they find the bed elevated, they wear its substance away, and deposit the sediment in the next hollow, so as in time to make the bottom of their channels even. On the other hand, the water is continually gnawing and eating away the banks on each side; and this with more force as the current happens to strike more directly against them. By these means it always has a tendency to render them more straight and parallel to its own course. Thus it continues to rectify its banks and enlarge its bed; and, consequently, to diminish the force of its stream, till there becomes an equilibrium between the force of the water, and the resistance of its banks, upon which both will remain without any further mutation. And it is happy for man that bounds are thus put to the erosion of the earth by water; and that we find all rivers only dig and widen themselves but to a certain degree."[9]

In those plains[10] and large valleys where great rivers flow, the bed of the river is usually lower than any part of the valley. But it often happens, that the surface of the water is higher than many of the grounds that are adjacent to the banks of the stream. If, after inundations, we take a view of some rivers, we shall find their banks appear above water at a time that all the adjacent valley is overflowed. This proceeds from the frequent deposition of mud, and such like substances, upon the banks, by the rivers frequently overflowing; and thus, by degrees, they become elevated above the plain; and the water is often seen higher also.

Rivers, as everybody has seen, are always broadest at the mouth, and grow narrower towards their source. But what is less known, and probably more deserving curiosity, is, that they run in a more direct channel as they immediately leave their sources; and that their sinuosities and turnings become more numerous as they proceed. It is a certain sign among the savages of North America, that they are near the sea, when they find the rivers winding, and every now and then changing their direction. And this is even now become an indication to the Europeans themselves, in their journeys through those trackless forests. As those sinuosities, therefore, increase as the river approaches the sea, it is not to be wondered at that they sometimes divide, and thus disembogue by different channels. The Danube disembogues into the Euxine by seven mouths; the Nile by the same number; and the Wolga by seventy.

The currents[11] of rivers are to be estimated very differently from the manner in which those writers, who have given us mathematical theories on this subject, represent them. They found their calculations upon the surface being a perfect plain from one bank to the other: but this is not the actual state of nature; for rivers in general rise in the middle: and this convexity is greatest in proportion as the rapidity of the stream is greater. Any person, to be convinced of this, need only lay his eye, as nearly as he can, on a level with the stream, and looking across to the opposite bank, he will perceive the river in the midst to be elevated considerably above what it is at the edges. This rising, in some rivers, is often found to be three feet high; and is ever increased in proportion to the rapidity of the stream. In this case, the water in the midst of the current loses a part of its weight, from the velocity of its motion; while that at the sides, for the contrary reason, sinks lower. It someimes however happens, that this appearance is eversed; for when tides are found to flow up ith violence against the natural current of the ater, the greatest rapidity is then found at the des of the river, as the water there least resists he influx from the sea. On those occasions, herefore, the river presents a concave rather han a convex surface; and as, in the former ase, the middle waters rose in a ridge, in this ase they sink in a furrow.

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[8] Many great rivers, in fact, flow with an almost imperceptible declivity. The river of the Amazons has only ten feet and a-half of declivity upon two hundred leagues of extent of water, which makes $\frac{1}{27}$ of an inch for every 1,000 feet. The Seine, between Valvins and Serves, has only one foot declivity out of 6,600. The Loire has, between Pouilly and Briare, one foot in 7,500; but between Briare and Orleans only one foot in 13,596. In East Frizeland, in the United Provinces, two small neighbouring rivers have, the one $\frac{1}{8}$ of an inch, the other $\frac{1}{3}$ of declivity for every 1,000 feet. The Marwede, between Herdinxveld and Dort, falls an inch along 1,125 feet; but between Dort and the sea, only one inch along 9,000 feet. Even the most rapid rivers have less declivity than is commonly imagined. The Rhine between Schauffhausen and Strasburg has a fall of 4 feet in a mile; and of 2 feet between Strasburg and Schenkenschantz. Hence we see the reason why one river may receive another almost as large as itself, without any considerable enlargement of its bed; the augmentation of its body only accelerates its course. Sometimes one river falling into another with great rapidity, and at a very acute angle, will force the former to retrace its course, and return for a short space towards its source. This has happened more than once to the Rhone near Geneva; the impetuous Arva, which descends from the mountains of Savoy, being swollen beyond its usual size, has made the more gentle waters of the Rhone flow back into the lake of Geneva; causing the wheels of the mills to revolve backwards. Some rivers have no stream whatever, and the cause is easily discovered; the land having scarcely any declivity, does not impart a sufficiently strong impulse to their waters, which are constantly retarded, and finally absorbed by the sand. Sometimes these waters are evaporated by the heat of the sun, as is the case with the rivers of Arabia and Africa; but they more commonly flow into pools, marshes, or salt lakes.—Ed.

[9] Guglielmini della Natura de Fiumi, *passim*.

[10] Buffon des Fleuves, *passim*, vol. ii.

[11] Ibid.

The stream of all rivers is more rapid in proortion as its channel is diminished. For inance, it will be much swifter where it is ten ards broad, than where it is twenty; for the rce behind still pushing the water forward, hen it comes to the narrow part, it must make p by velocity what it wants in room.

It often happens that the stream of a river is pposed by one of its jutting banks, by an island the midst, the arches of a bridge, or some such bstacle. This produces not unfrequently a back urrent; and the water having passed the arch ith great velocity, pushes the water on each de of its direct current. This produces a side urrent, tending to the bank; and not unfreuently a whirlpool; in which a large body of aters are circulated in a kind of cavity, sinking own in the middle. The central point of the hirlpool is always lowest, because it has the ast motion: the other parts are supported, in me measure, by the violence of theirs, and conquently rise higher as their motion is greater; that towards the extremity of the whirlpool, ust be higher than towards the centre.

If the stream of a river be stopped at the surace, and yet be free below; for instance, if it be id over by a bridge of boats, there will then be double current; the water at the surface will ow back, while that at the bottom will proceed ith increased velocity. It often happens that he current at the bottom is swifter than at the p, when, upon violent land-floods, the weight waters towards the source presses the waters the bottom, before it has had time to commuicate its motion to the surface. However, in all ther cases, the surface of the stream is swifter han the bottom, as it is not retarded by rubbing ver the bed of the river.

It might be supposed that bridges, dams, and ther obstacles in the current of a river, would etard its velocity. But the difference they make very inconsiderable. The water, by these stopages, gets an elevation above the object; which, hen it has surmounted, it gives a velocity that ecompenses the former delay. Islands and turngs also retard the course of the stream but very considerably; any cause which diminishes the uantity of the water, most sensibly diminishes e force and the velocity of the stream.

An increase[12] of water in the bed of the river ways increases its rapidity; except in cases of inundation. The instant the river has overflowed its banks, the velocity of its current is always turned that way, and the inundation is perceived to continue for some days; which it would not otherwise do, if, as soon as the cause was discontinued, it acquired its former rapidity.

A violent storm, that sets directly up against the course of the stream, will always retard, and sometimes entirely stop its course. I have seen an instance of this, when the bed of a large river was left entirely dry for some hours, and fish were caught among the stones at the bottom.

Inundations are generally greater towards the source of rivers than farther down; because the current is generally swifter below than above; and that for the reasons already assigned.

A little river[13] may be received into a large one, without augmenting either its width or depth. This, which at first view seems a paradox, is yet very easily accounted for. The little river, in this case, only goes towards increasing the swiftness of the larger, and putting its dormant waters into motion. In this manner the Venetian branch of the Po was pushed on by the Ferrarese branch and that of Panaro, without any enlargement of its breadth or depth from these accessions.

A river tending to enter another, either perpendicularly, or in an opposite direction, will be diverted by degrees from that direction; and be obliged to make itself a more favourable entrance downward, and more conspiring with the stream of the former.

The union of two rivers into one, makes it flow the swifter; since the same quantity of water, instead of rubbing against four shores, now only rubs against two. And, besides, the current being deeper, becomes, of consequence, more fitted for motion.

With respect to the places from whence rivers proceed, it may be taken for a general rule, that the largest[14] and highest mountains supply the greatest and most extensive rivers. It may also be remarked, in whatever direction the ridge of the mountain runs, the river takes an opposite course. If the mountain, for instance, stretches from north to south, the river runs from east to west; and so contrariwise. These are some of the most generally received opinions with regard to the course of rivers; however, they are liable to many exceptions; and nothing but an actual knowledge of each particular river can furnish us with an exact theory of its current.

The largest rivers of Europe are, first, the Wolga, which is about six hundred and fifty leagues in length, extending from Reschow to Astrachan. It is remarkable of this river, that it abounds with water during the summer months of May and June; but all the rest of the year is so shallow as scarce to cover its bottom, or allow a passage for loaded vessels that trade up its stream. It was up this river that the English attempted to trade into Persia, in which they were so unhappily disappointed, in the year 1741. The next in order is the Danube. The course of this is about four hundred and fifty leagues, from the mountains of Switzerland to the Black sea. It is so deep between Buda and Belgrade, that the Turks and Christians have fleets of men-of-war upon it; which frequently engaged during the last war between the Ottomans and the Austrians: however it is unnavigable further down, by reason of its cataracts, which prevent its commerce into the Black sea. The Don, or Tanis, which is four hundred leagues from the source of that branch of it called the *Softna*, to its mouth in the Euxine sea. In one part of its course, it approaches near the Wolga; and Peter the Great had actually begun a canal, by which he intended joining those two rivers; but this he did not live to finish. The Nieper, or Boristhenes, which rises in the middle of Muscovy, and runs a course of three hundred and fifty leagues, to empty itself into the Black sea. The Old Cossacks inhabit the banks and islands of this river; and frequently cross the Black sea, to plunder the maritime places on the coasts of Turkey. The Dwina, which takes its rise in the province of the same name in Russia, that runs a course of three hundred leagues, and disembogues into the White sea, a little below Archangel.

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[12] Buffon, vol. ii. p. 62.

[13] Guglielmini.

[14] Dr. Halley.

The largest rivers of Asia are, the Hohanho, in China, which is eight hundred and fifty leagues in length, computing from its source at Raja Ribron, to its mouth in the gulf of Changi. The Jenisca of Tartary, about eight hundred leagues in length, from the lake Selinga, to the Icy sea. This river is, by some, supposed to supply most of that great quantity of drift wood which is seen floating in the seas near the Arctic circle. The Oby, of five hundred leagues, running from the lake of Kila into the Northern sea. The Amour, in Eastern Tartary, whose course is about five hundred and seventy-five leagues, from its source to its entrance into the sea of Kamtschatka. The Kiam, in China, five hundred and fifty leagues in length. The Ganges, one of the most noted rivers in the world, and about as long as the former.[15] It rises in the mountains which separate India from Tartary; and running through the dominions of the Great Mogul, discharges itself by several mouths into the bay of Bengal. It is not only esteemed by the Indians for the depth and pureness of its stream, but for a supposed sanctity which they believe to be in its waters. It is visited annually by several hundred thousand pilgrims, who pay their devotions to the river as to a god: for savage simplicity is always known to mistake the blessings of the Deity, for the Deity himself. They carry their dying friends from distant countries, to expire on its banks; and to be buried in its stream. The water is lowest in April or May; but the rains beginning to fall soon after, the flat country is overflowed for several miles, till about the end of September; the waters then begin to retire, leaving a prolific sediment behind, that enriches the soil, and, in a few days' time, gives a luxuriance to vegetation, beyond what can be conceived by a European. Next to this may be reckoned the still more celebrated river Euphrates. This rises from two sources, northward of the city Erzerum, in Turcomania, and unites about three days' journey below the same; from whence, after performing a course of five hundred leagues, it falls into the gulf of Persia, fifty miles below the city of Bassora in Arabia. The river Indus is extended, from its source to its discharge into the Arabian sea, four hundred leagues.

The largest rivers of Africa are, the Senegal, which runs a course of not less than eleven hundred leagues, comprehending the Niger, which some have supposed to fall into it. However, later accounts seem to affirm that the Niger is lost in the sands, about three hundred miles up from the western coasts of Africa.[16] Be this as it may, the Senegal is well known to be navigable for more than three hundred leagues up the country; and how much higher it may reach is not yet discovered, as the dreadful fatality of the inland parts of Africa, not only deters curiosity, but even avarice, which is a much stronger passion. At the end of last war, of fifty Englishmen that were sent to the factory at Galam, a place taken from the French, and nine hundred miles up the river, only one returned to tell the fate of his companions, who were destroyed by the climate. The celebrated river Nile is said to be nine hundred and seventy leagues, from its source among the Mountains of the Moon, in Upper Æthiopia, to its opening into the Mediterranean sea.[17] The sources of this river were considered as inscrutable by the ancients; and the causes of its periodical inundation were equally unknown. They have both been ascertained by the missionaries who have travelled into the interior parts of Æthiopia. The Nile takes its rise in the kingdom of Gojam,[18] from a small aperture on the top of a mountain, which, though not above a foot and a half over, yet was unfathomable. This fountain, when arrived at the foot of the mountain, expands into a river; and being joined by others, forms a lake thirty leagues long, and as many broad; from this, its channel, in some measure, winds back to the country where it first began; from thence, precipitating by frightful cataracts, it travels through a variety of desert regions, equally formidable, such as Amhara, Olaca, Damot, and Xaoa. Upon its arrival in the kingdom of Upper Egypt, it runs through a rocky channel, which some late travellers have mistaken for its cataracts. In the beginning of its course, it receives many lesser rivers into it; and Pliny was mistaken in saying that it received none. In the beginning also of its course it has many windings; but, for above three hundred leagues from the sea, it runs in a direct line. Its annual overflowings arise from a very obvious cause, which is almost universal with the great rivers that take their source near the line. The rainy season, which is periodical in those climates, floods the rivers; and as this always happens in our summer, so the Nile is at that time overflown. From these inundations, the inhabitants of Egypt derive happiness and plenty; and, when the river does not arise to its accustomed heights, they prepare for an indifferent harvest. It begins to overflow about the seventeenth of June; it generally continues to augment for forty days, and decreases in about as many more. The time of increase and decrease, however, is much more inconsiderable now than it was among the ancients. Herodotus informs us, that it was an hundred days rising, and as many falling; which shows that the inundation was much greater at that time than at present. Mr. Buffon[19] has ascribed the present diminution, as well to the lessening of the Mountains of the Moon, by their substance having so long been washed down with the stream, as to the rising of the earth in Egypt, that has for so many ages received this extraneous supply. But we do not find, by the buildings that have remained since the time of the ancients, that the earth is much raised since then. Besides the Nile in Africa, we may reckon the Zara, and the Coanza, from the greatness of whose openings into the sea, and the rapidity of whose streams, we form an estimate of the great distance from whence they come. Their courses, however, are spent in watering deserts and savage countries, whose poverty or fierceness have kept strangers away.

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[15] See Supplementary Note B, p. 128.

[16] See Supplementary Note C, p. 128.

[17] See Supplementary Note D, p. 129.

[18] Kircher, Mund. Subt. vol. ii. p. 72.

But of all parts of the world, America, as it exhibits the most lofty mountains, so also it supplies the largest rivers. The foremost of these is the great river Amazon, which, from its source in the lake of Lauricocha, to its discharge into the Western Ocean, performs a course of more than twelve hundred leagues.[20] The breadth and depth of this river are answerable to its vast length; and, where its width is most contracted, its depth is augmented in proportion. So great is the body of its waters, that other rivers, though before the objects of admiration, are lost in its bosom. It proceeds after their junction, with its usual appearance, without any visible change in its breadth or rapidity; and, if we may so express it, remains great without ostentation. In some places it displays its whole magnificence, dividing into several large branches, and encompassing a multitude of islands; and, at length, discharging itself into the ocean, by a channel of a hundred and fifty miles broad. Another river, that may almost rival the former, is the St. Lawrence in Canada, which rising in the lake Assiniboils, passes from one lake to another, from Christinaux to Alempigo; from thence to lake Superior; thence to the lake Hurons; to lake Erie; to lake Ontario; and, at last, after a course of nine hundred leagues, pours their collected waters into the Atlantic Ocean. The river Mississippi is of more than seven hundred leagues in length, beginning at its source near the lake Assiniboils, and ending at its opening into the gulf of Mexico. The river Plate runs a length of more than eight hundred leagues from its source in the river Parana, to its mouth. The river Oroonoko is seven hundred and fifty-five leagues in length, from its source near Pasta, to its discharge into the Atlantic Ocean.

Such is the amazing length of the greatest rivers; and even in some of these, the most remote sources very probably yet continue unknown. In fact, if we consider the number of rivers which they receive, and the little acquaintance we have with the regions through which they run, it is not to be wondered at that geographers are divided concerning the sources of most of them. As among a number of roots by which nourishment is conveyed to a stately tree, it is difficult to determine precisely that by which the tree is chiefly supplied; so among the many branches of a great river, it is equally difficult to tell which is the original. Hence it may easily happen, that a similar branch is taken for the capital stream; and its runnings are pursued, and delineated, in prejudice of some other branch that better deserved the name and the description. In this manner,[21] in Europe, the Danube is known to receive thirty lesser rivers; the Wolga thirty-two or thirty-three. In Asia, the Hohanho receives thirty-five; the Jenisca above sixty; the Oby as many; the Amour about forty; the Nanquin receives thirty rivers; the Ganges twenty; and the Euphrates about eleven. In Africa, the Senegal receives more than twenty rivers; the Nile receives not one for five hundred leagues upwards, and then only twelve or thirteen. In America, the river Amazon receives above sixty, and those very considerable; the river St. Lawrence about forty, counting those which fall into its lakes; the Mississippi receives forty; and the river Plate above fifty.

I mentioned the inundations of the Ganges and the Nile; but almost every other great river, whose source lies within the tropics, have their stated inundations also. The river Pegu has been called, by travellers, the Indian Nile, because of the similar overflowings of its stream; this it does to an extent of thirty leagues on each side; and so fertilizes the soil, that the inhabitants send great quantities of rice into other countries, and have still abundance for their own consumption. The river Senegal has likewise its inundations, which cover the whole flat country of Negroland, beginning and ending much about the same time with those of the Nile; as, in fact, both rivers rise from the same mountains. But the difference between the effects of the inundations in each river is remarkable: in the one, it distributes health and plenty; in the other, diseases, famine, and death. The inhabitants along the torrid coasts of the Senegal can receive no benefit from any additional manure the river may carry down to their soil, which is by nature more than sufficiently luxuriant; or, even if they could, they have not industry to turn it to any advantage. The banks, therefore, of the rivers, lie uncultivated, overgrown with rank and noxious herbage, and infested with thousands of animals of various malignity. Every new flood only tends to increase the rankness of the soil, and to provide fresh shelter for the creatures that infest it. If the flood continues but a few days longer than usual, the improvident inhabitants, who are driven up in the higher grounds, want provisions, and a famine ensues. When the river begins to return into its channel, the humidity and heat of the air are equally fatal; and the carcases of infinite numbers of animals, swept away by the inundation, putrefying in the sun, produce a stench that is almost insupportable. But even the luxuriance of the vegetation becomes a nuisance. I have been assured, by persons of veracity who have been up the river Senegal, that there are some plants growing along the coast, the smell of which is so powerful, that it is hardly to be endured. It is certain, that all the sailors and soldiers who have been at any of our factories there, ascribe the unwholesomeness of the voyage up the stream, to the vegetable vapour. However this be, the inundations of the rivers in this wretched part of the globe, contribute scarce any advantage, if we except the beauty of the prospects which they afford. These, indeed, are finished beyond the utmost reach of art: a spacious glassy river, with its banks here and there fringed to the very surface by the mangrove-tree, that grows down into the water, presents itself to view; lofty forests of various colours, with openings between, carpeted with green plants, and the most gaudy flowers; beasts and animals, of various kinds, that stand upon the banks of the rivers, and, with a sort of wild curiosity, survey the mariners as they pass, contribute to heighten the scene. This is the sketch of an African prospect; which delights the eye, even while it destroys the constitution.

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[19] Buffon, vol. ii. p. 82.

[20] Ulloa, vol. i. p. 388.

[21] Buffon, vol. ii. p. 74.

Besides these annually periodical inundations, there are many rivers that overflow at much shorter intervals. Thus most of those in Peru and Chili have scarce any motion by night; but upon the appearance of the morning sun, they resume their former rapidity: this proceeds from the mountain snows, which, melting with the heat, increase the stream, and continue to drive on the current, while the sun continues to dissolve them. Some rivers also flow with an even steady current, from their source to the sea; others flow with greater rapidity, their stream being poured down in a cataract, or swallowed by the sands, before they reach the sea.

The rivers of those countries that have been least inhabited, are usually more rocky, uneven, and broken into waterfalls or cataracts, than those where the industry of man has been more prevalent. Wherever man comes, nature puts on a milder appearance: the terrible and the sublime are exchanged for the gentle and the useful: the cataract is sloped away into a placid stream; and the banks become more smooth and even.[22] It must have required ages to render the Rhone or the Loire navigable: their beds must have been cleaned and directed; their inequalities removed; and, by a long course of industry, Nature must have been taught to conspire with the desires of her controller. Every one's experience must have supplied instances of rivers thus being made to flow more evenly, and more beneficially to mankind; but there are some whose currents are so rapid, and falls so precipitate, that no art can obviate; and that must for ever remain as amazing instances of incorrigible nature.

Of this kind are the cataracts of the Rhine; one of which I have seen exhibit a very strange appearance; it was that at Schathausen, which was frozen quite across, and the water stood in columns where the cataract had formerly fallen. The Nile, as was said, has its cataracts. The river Vologda, in Russia, has two. The river Zara, in Africa, has one near its source. The river Velino, in Italy, has a cataract of above an hundred and fifty feet perpendicular. Near the city of Gottenburg,[23] in Sweden, the river rushes down from a prodigious high precipice, into a deep pit, with a terrible noise, and such dreadful force, that those trees designed for the masts of ships, which are floated down the river, are usually turned upside down in their fall, and often are shattered to pieces, by being dashed against the surface of the water in the pit; this occurs if the masts fall sideways upon the water; but if they fall endways, they dive so far under water, that they disappear for a quarter of an hour, or more: the pit, into which they are thus plunged, has been often sounded with a line of some hundred fathoms long, but no ground has been found hitherto. There is also a cataract at Powerscourt, in Ireland, in which, if I am rightly informed, the water falls three hundred feet perpendicular; which is a greater descent than that of any other cataract in any part of the world. There is a cataract at Albany, in the province of New York, which pours its stream fifty feet perpendicular. But of all the cataracts in the world, that of Niagara, in Canada, if we consider the great body of water that falls, must be allowed to be the greatest, and the most astonishing.

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[22] Buffon, vol. ii. p. 90.

[23] Phil. Trans vol. ii. p. 325.

This amazing fall of water is made by the river St. Lawrence, in its passage from the lake Erie into the lake Ontario. We have already said that the St. Lawrence was one of the largest rivers in the world; and yet the whole of its waters are here poured down by a fall of a hundred and fifty feet perpendicular. It is not easy to bring the imagination to correspond with the greatness of the scene; a river, extremely deep and rapid, and that serves to drain the waters of almost all North America into the Atlantic ocean, is here poured precipitately down a ledge of rocks, that rise, like a wall, across the whole bed of its stream. The width of the river, a little above, is near three quarters of a mile broad; and the rocks, where it grows narrower, are four hundred yards over. Their direction is not straight across, but hollowing inwards like a horse-shoe; so that the cataract, which bends to the shape of the obstacle, rounding inwards, presents a kind of theatre the most tremendous in nature. Just in the middle of this circular wall of waters, a little island, that has braved the fury of the current, presents one of its points, and divides the stream at top into two; but it unites again long before it has got to the bottom. The noise of the fall is heard at several leagues' distance; and the fury of the waters at the bottom of their fall is inconceivable. The dashing produces a mist that rises to the very clouds; and that produces a most beautiful rainbow, when the sun shines. It may easily be conceived, that such a cataract quite destroys the navigation of the stream; and yet some Indian canoes, as it is said, have been known to venture down it with safety.[24]

Of those rivers that lose themselves in the sands, or are swallowed up by chasms in the earth, we have various information. What we are told by the ancients, of the river Alpheus, in Arcadia, that sinks into the ground, and rises again near Syracuse in Sicily, where it takes the name of Arethusa, is rather more known than credited. But we have better information with respect to the river Tigris being lost in this manner under mount Taurus; of the Guadalquiver, in Spain, being buried in the sands; of the river Greatah, in Yorkshire, running under ground, and rising again; and even of the great Rhine itself, a part of which is no doubt lost in the sands, a little above Leyden. But it ought to be observed of this river, that by much the greatest part arrives at the ocean; for, although the ancient channel which fell into the sea, a little to the west of that city, be now entirely choked up, yet there are still a number of small canals, that carry a great body of waters to the sea; and, besides, it has also two very large openings, the Lech and the Waal, below Rotterdam, by which it empties itself abundantly.

Be this as it will, nothing is more common in sultry and sandy deserts, than rivers being thus either lost in the sands, or entirely dried up by the sun. And hence we see, that under the line the small rivers are but few; for such little streams as are common in Europe, and which with us receive the name of rivers, would quickly evaporate in those parching and extensive deserts. It is even confidently asserted, that the great river Niger is thus lost before it reaches the ocean; and that its supposed mouths, the Gambia and the Senegal, are distinct rivers, that come a vast way from the interior parts of the country. It appears, therefore, that the rivers under the line are large; but it is otherwise at the poles,[25] where they must necessarily be small. In that desolate region, as the mountains are covered with perpetual ice, which melts but little, or not at all, the springs and rivulets are furnished with a very small supply. Here, therefore, men and beasts would perish, and die for thirst, if Providence had not ordered, that in the hardest winter, thaws should intervene, which deposit a small quantity of snow-water in pools under the ice; and from this source the wretched inhabitants drain a scanty beverage.

Thus, whatever quarter of the globe we turn to, we shall find new reasons to be satisfied with that part of it in which we reside. Our rivers furnish all the plenty of the African stream, without its inundation; they have all the coolness of the polar rivulet, with a more constant supply; they may want the terrible magnificence of huge cataracts, or extensive lakes, but they are more navigable, and more transparent; though less deep and rapid than the rivers of the torrid zone, they are more manageable, and only wait the will of man to take their direction. The rivers of the torrid zone, like the monarchs of the country, rule with despotic tyranny; profuse in their bounties, and ungovernable in their rage. The rivers of Europe, like their kings, are the friends, and not the oppressors, of the people; bounded by known limits, abridged in the power of doing ill, directed by human sagacity, and only at freedom to distribute happiness and plenty.

NOTE A.—*Evaporation.*

The property which water has of evaporating spontaneously at all temperatures, is one of the most important in the whole economy of nature. For upon it the growth of plants, and the existence of living creatures upon the earth, depends. The vapours thus continually rising, not merely from the surface of the sea, lakes, and rivers, but also from the dry land, are again condensed, and fall in the state of rain or dew. The rain penetrates into the earth, and makes its way out again in springs. These collecting together, constitute rivers, which making their way to the sea, afford the means of living and enjoyment to numerous tribes and languages which occupy their banks. Let us suppose for a moment that this spontaneous evaporation were to cease, and let us contemplate the consequences. No more rain or dew could fall, the springs would cease to flow, the rivers would be dried up; the whole water in the globe would be accumulated in the ocean; the earth would become dry and parched; vegetables being deprived of moisture, could no longer continue to grow; the cattle and beasts of every kind would lack their usual food; man himself would perish; the earth would become a dull, inanimate, sterile mass, without any vegetables to embellish its surface, or any living creature to wander through its frightful deserts.

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[24] This is now totally discredited. See Supplementary Note E, p. 129.—ED.

[25] Crantz's History of Greenland, vol. i. p. 41.

If the atmosphere contained no vapour whatever, the annual evaporation from the surface of water could easily be determined, provided we were acquainted with the mean temperature of the place. But as the atmosphere is never free from vapour, we must either determine the mean quantity present by trial, or determine the actual evaporation by experiment. Now as far as evaporation is concerned, the surface of the globe presents three principal varieties; namely, water, ground covered with grass or other vegetables, and bare soil.

Dr. Dobson made a set of experiments during the years 1772, 1773, 1774, and 1775, to determine the evaporation from the surface of water at Liverpool during these years. He took a cylindrical vessel of twelve inches diameter, and having nearly filled it with water, exposed it beside a rain-gauge of the same aperture, and by adding water, or removing it occasionally, he kept the surface at nearly the same height. By carefully registering the quantities added or taken away, and comparing them with the rain that fell, the amount of evaporation was ascertained. The mean annual evaporation from the surface of water at Liverpool amounted to 36·37 inches. The mean annual fall of rain at Liverpool, as ascertained by Dr. Dobson, is (without reckoning the dew) 37·48 inches. We see at once from this that more rain falls at Liverpool than can be accounted for by the evaporation. Consequently there must be a supply of vapour from the sea, and probably from the warmer regions of the globe.

A set of experiments upon the evaporation from ground covered with vegetables, and from bare soil, was made by Mr. Thomas Hoyle and Mr. Dalton, at Manchester, during the years 1796, 1797, 1798. They got a cylindrical vessel of tinned iron, ten inches in diameter, and three feet deep. There were inserted into it two pipes turned downwards, for the water to run off from it into bottles. One of these pipes was near the bottom of the vessel, the other was an inch from the top. This vessel was filled up for a few inches with gravel and sand, and all the rest of it with good fresh soil. It was then put into a hole in the ground, and the space around filled up with earth, except on one side for the convenience of putting bottles to the two pipes. Water was poured on to sadden the earth, and as much as would was suffered to run through without notice, by which the earth might be considered saturated as with water. For some weeks the soil was constantly above the level of the upper pipe, but latterly it was always a little below it; which made it impossible for any water to run through the upper pipe. For the first year, the soil at top was bare, but during the last two years it was covered with grass the same as a green field. Things being thus circumstanced, a regular register was kept of the quantity of rain water that ran off from the surface of the earth by the upper pipe (while that took place), and also of the quantity which sunk down through the three feet of earth, and ran out through the lower pipe. A rain-gauge of the same diameter was kept close by to find the quantity of rain for any corresponding time. By this apparatus the quantity evaporated from the earth in the vessel during three years was ascertained. The annual evaporation was 25·158 inches. Now if to the rain we add five inches for dew (not reckoned in Mr. Dalton's operations), it follows that the mean annual evaporation from earth at Manchester, amounts to thirty inches. It follows likewise, from these observations of Dalton and Hoyle, that there is but little difference between the evaporation of green soil and bare soil. For the evaporation during the first year, when the soil in the vessel was bare, differed but little from that of the two following years, when it was covered with grass.

NOTE B.—*The Ganges.*

The Ganges pursues a course of 1,350 miles. It is a smooth-running and navigable river, and is supposed to employ upon it 30,000 boatmen. About 220 miles from the sea (but 300 reckoning the windings of the rivers), commences the head of the delta of the Ganges, which is considerably more than twice the area of the Nile. The inundation of the river is in the latter end of July, and overflows an extent of 100 miles in breadth, contiguous to the river. The inundations of the Ganges and the Nile differ in this particular, that the Nile owes its floods entirely to the rain water that falls in the mountains, near its source; but the inundations in Bengal are as much occasioned by the rain that falls there, as by the waters of the Ganges; as a proof of it, the lands in general are overflowed to a considerable height long before the bed of the river is filled. The average swell of the Ganges, in the rainy seasons, is about 31 feet, and its fall about four inches per mile; and the river flows at the rate of about three miles in the hour, but in the rainy season the rate is increased to six miles in the hour. The average quantity of water discharged by the Ganges into the sea is 80,000 cubic feet per second: but during the rainy season the quantity discharged amounts to 405,000 cubic feet. The Ganges varies its channel very much during its course through Bengal, wearing away the banks on one side, while land is formed on the other side. The Burrampooter, which has its source from the opposite side of the same mountains (the mountains of Thibet) that give rise to the Ganges, first takes its course eastward, or directly opposite to that of the Ganges, through the country of Thibet, where it is named the Sanpoo, or Zanciu, which bears the same interpretation as the Gonga of Hindostan; namely, 'the River.' The Burrampooter enters Bengal on the north-east, after which it makes a circuit round the western point of the Marrow mountains; and then altering its course to south it meets the Ganges, about 40 miles from the sea. It is larger than the Ganges, and during the last 60 miles, before it forms a junction with that river, its width is regularly from four to five miles, and, but for its freshness, might pass for an arm of the sea. Major Rennel was the original discoverer that the Sanpoo, of Thibet, is the same with the Burrampooter. Before that time the Sanpoo had been supposed to discharge into the sea by the gulf of Ava.

NOTE C.—*The Niger.*

Many attempts have been made to determine the course of the Niger both by geographers and travellers in ancient as well as modern times; but geographers were long involved in the darkness of conflicting theories and contradictory reports. The very direction of this river was for a long period a debateable question. The Arabs of the middle ages attributed to the Niger a westward course to 'the Sea of Darkness,' or the Atlantic. They also conceived that the Niger and the Nile sprung from the same origin. Leo Africanus, however, acknowledges that some geographers had made the Niger run from west to east, and terminate in a great lake. This was in fact the opinion of Herodotus 2,000 years before; and in this opinion Ptolemy had coincided. The Portuguese, on seeing the Senegal, the Gambia, and other great rivers proceeding from the unknown interior of Africa, discharge themselves into the Atlantic, conceived that these rivers might be the mouths of the Niger itself, and therefore gave it a westward course. It was reserved for Mungo Park, to decide the question as to the direction of the Niger in favour of the old Grecian geographer: on the 21st of July, 1796, that intrepid traveller beheld, from the heights of Sego, "the majestic Niger flowing slowly from west to east." Equally unsettled were the early notions as to the source of this river: for whilst some believed it to originate in the mountains of Mauritania, others affirmed that it issued from a lake to the south of Bornou; and others, as we have hinted, identified its fountain-head with that of the Nile. It is now decided from observation that the great central river of Africa has its source near Mount Lamba, in the country of the Soulimas, on the northern declivities of the Kong mountains, between 9° and 10° west of Greenwich, and, according to Major Laing, at an elevation of 1,638 feet above the level of the Atlantic. It runs first north-east through an unexplored country; and then, inclining a little more towards the east, passes the large cities of Bammakou, Yamima, Sego, and Sansanding. From the latter place it runs north-east through lake Dibbie, to Timbuctoo, and thence sweeps in a circular direction to the south of Houssa. Messrs. Denham and Clapperton, in 1821, on visiting Soccatoo, in 6° 10′ E. long., found that the Niger there flowed to the south, under the name of the Quora. In 1825, Clapperton again set out on a tour of discovery, and crossed the Niger at Boussa. On this expedition, he was accompanied by his servant, Richard Lander, who, after the death of his master, attempted to descend the Niger from Fundah, but was prevented by the jealousy of the government. In 1830, Lander set out from Badagry, with his brother John, for the purpose of following down the course of the river to its mouth. They reached the river at Boussa; ascended to Youri and the Cubbie, which comes from Soccatoo; and then descended the river, which flows nearly south from Boussa, and which, after receiving the Shary, expands into a large lake, and empties itself, by several arms, into the Bight of Benin. The mouth by which they reached the sea, is laid down on the maps as the river Nun. Thus from Park's first point, in 1805, its course is traced for 2,000 miles, a considerable part of which is navigable for steamboats.

NOTE D.—*The Nile.*

The length of the Nile is about 2,000 miles; but, as it receives few collateral branches, and none from the mouth of the Tacazze to the Delta—a distance of nearly 1,350 nautical miles—its breadth is seldom, if ever, more than one-third of a mile, and its average depth is only about 12 feet. This, however, must be understood as relating to its situation when confined within its banks; during an inundation, it lays every level spot upon its banks under water. The ancients were not well acquainted with any other river which annually inundated the country around it. This circumstance, therefore, must have attracted no inconsiderable share of their attention. To moderns, the overflowing of the Nile is no longer a matter of surprise; nor is the Nile in this respect singular. Every river which has its source within the tropics annually overflows its banks; and the cause is the same in all. The incessant torrents of rain which attend the vertical sun, and which constitute the winter of tropical regions, swell every river beyond its ordinary bounds, and lay the level country under water. This is found to be the case with the Plata and the Amazon, and with every considerable stream whose source is not far removed from the equator. The Nile rises within the tropics, and consequently inundates yearly the neighbouring countries. The proper rise of the waters is to the inhabitants an affair the most important. A few feet less than the ordinary height, would prevent the spreading of the waters to a sufficient distance; a few feet more than the usual quantity would prevent the water from draining off in the proper season for sowing, and spread devastation throughout the country, as in the years 1818 and 1829; and, in either case, a famine, and perhaps an extensive loss of lives, would be the consequence. When the Nile has attained the proper height, and when it seems not to rise too far, Egypt is the scene of festivity and congratulation; the inhabitants are assured of abundance, and anticipate with joy the approaching harvest.

Of the sources of this river, much ignorance and difference of opinion long prevailed; but it now appears that the sources of one of its principal branches —if not of the Nile itself—was known to Europeans long before they credited the fact. Bruce, it is true—who undertook a search which was believed to have eluded every former adventurer—assures us that he was the first of Europeans who saw the fountains from which the Nile originates; and, so anxious was he to secure this honour to himself, that he minutely examines the accounts of such travellers as pretend to have visited them before him, and his decision, as was to be expected, is in his own favour. But his examination of Kircher's account of the sources of the Nile, plainly evinces, that the latter either visited these sources himself, or received his information from such as had visited them. What were considered the sources of the Blue River, by some regarded as the head or main branch of the Nile, were found and described by two Jesuits, Paez and Tellez, two centuries before the pretended discovery of Bruce. A few differences and inaccuracies detected by Bruce in the account, serve rather to confirm than invalidate the truth of this early visit. Still, Bruce deserves all praise for his enterprising and laborious researches; and the reception of his narrative, even by his own countrymen, can scarcely be accounted generous, when it is considered that it was at first doubted whether he had really ever seen the head of the river which he described as the chief branch of the Nile; and when this could no longer be insinuated, it was immediately discovered that he had only visited the head of an inferior branch, and that the true Nile originated far to the west, among the mountains of the Moon. Whether the branch visited by Bruce, called the Bahr-el-Azreek or 'Blue River,' or the Western branch, called the Bahr-el-Abiad or 'White River,' had the better claim to be regarded as the head or main branch of the Egyptian river was long disputed. The name of the Nile indicates its relation to the Blue river rather than to the other stream. M. Calliaud, a French traveller, who accompanied a predatory excursion of the pasha of Egypt's two sons into Nubia, states that two considerable rivers, the Tournet and the Jabousse, flow from Abyssinia into the Blue River,—the latter at the distance of two days and a half southward of Fazœle, —a circumstance which renders it impossible that the Azreek should have its rise in Abyssinia. But, wherever the most distant sources of the Nile are actually situated, it appears to be chiefly fed by the rivers of Abyssinia, and to these its inundations are chiefly owing. We may regard therefore the Abyssinian Nile, or the Blue River, as the head-stream of the river of Egypt.

NOTE E.—*Falls of Niagara.*

Those who first visited the falls of Niagara, struck no doubt with their terrific appearance, and wishing to convey to others magnificent ideas of what they had seen, gave the world very exaggerated accounts of them. Father Hennipin, for example, asserts that the precipice which produces the cataract is not less than 600 feet high, and that the noise is such, that people distant from it several miles cannot hear each other speak! However, it may safely be maintained that no description can convey an adequate idea of their awful sublimity. The most satisfactory account which we have hitherto seen of these falls, is that published in the American 'Philosophical Transactions,' by Mr. Ellicot. "Lake Erie," he observes, 'is situated upon a horizontal strata, in a region elevated about 300 feet above the country, which contains Lake Ontario. The descent which separates the two countries is in some places almost perpendicular; and the immense declivity formed by these strata, occasions both the cataract of Niagara, and the great falls of Cheneseco. This remarkable precipice generally runs in a south-western direction, from a place near the bay of Torento, on the northern side of Ontario, round the western angle of the lake: from thence it continues its course generally in an eastern direction, crossing the strait of Niagara and the Cheneseco river, till it is lost in the country towards the Seneca lake. The waters of this cataract formerly fell from the northern side of the slope, near the landing-place, but the action of such a tremendous column of water, falling from such an eminence, through a long succession of ages, has worn away the solid stone for the distance of seven miles, and formed an immense chasm, which cannot be approached without horror. Down this awful chasm, the waters are precipitated with amazing velocity, after they make the great pitch; and such a vast torrent of falling water communicates a tremulous motion to the earth, which is sensibly felt for some poles round, and produces a sound which is frequently heard at the distance of twenty miles. Many wild beasts that attempt to cross the rapids, above this great cataract, are destroyed; and if geese or ducks inadvertently alight on these rapids, they are incapable of rising on the wing again, and are hurried on to inevitable destruction. The great height of the banks renders the descent into the chasm extremely difficult; but a person, after having descended, may proceed to the base of the falls; and a number of persons may walk in perfect safety a considerable distance between the precipice and the descending torrent; where conversation is not much interrupted by the noise, which is not so great here as at some distance. A vapour or spray, of considerable density, resembling a cloud, continually ascends, in which a rainbow is always seen when the sun shines, and the position of the spectator is favourable. In the winter this spray attaches itself to the trees, where it is congealed in such quantities, as to divest them of their smaller branches, and produces a most beautiful crystalline appearance; a circumstance which attends the falls of Cheneseco, as well as those of Niagara. A singular appearance is observed at these falls, which has never perhaps been noticed by any writer. Immediately below the great pitch, a commixture of foam and water is puffed up in spherical figures, about the size of a common hay-cock. They burst at the top, and discharge a column of spray to a prodigious height; they then subside, and are succeeded by others, which exhibit the same appearance. These spherical forms are more conspicuous about mid-way between the west side of the strait, and the island which divides the falls, and where the largest column of water descends. This appearance is produced by the ascension of the air, which is carried down by the column of falling water in great quantities to the bed of the river. The river at the falls is about 743 yards wide, and the perpendicular pitch is 150 feet in height. In the last half mile, immediately above the falls, the descent of the water is 58 feet; but the difficulty which would attend the business, prevented me from attempting to level the rapids in the chasm below; though, from conjecture, I concluded that the waters must descend at least 65 feet; and from these results it appears, that the water falls about 273 feet in the distance of about seven miles and a-half."

A recent visitor to the falls thus describes them: "You must descend to the very edge of the trembling rocky brink of the caldron on the British side, immediately under the stairs, and 60 or 70 feet below the narrow platform of the rock on which you have stood when you have reached the last of these stairs. This is not to be effected without some trouble, risk, and fatigue; but it repays all your exertion, for when you have reached the edge, close to the Rainbow or Split Rock, you are, as it were, at once in a new world—chaos seems there to have never been disturbed by the regularity of nature, but reigns solemn and supreme. Place your back against the projecting, blackened, and slime-covered rocks, and look towards the mighty mass of vapour and water before you, around you, beneath you, and above you. Hearing, sight, feeling, become as it were blended and confounded. You are sensible that you exist, perhaps, but in what state of existence has, for a few minutes, vanished from your imagination. The rocks vibrate under your feet; the milk-white, boiling, and mountain surge advances, swells up, subsides, recoils, lashes, and mingles with the thick vapour. An indescribable and terrific, dull, yet deafening sound, shakes the air; your nerves feel the concussion, and the words of surprise which at length escape from your lips are inaudible even to yourself, so awfully stern is the uproar of the contending air and water in their conflict for mastery. The ideas which first struck me when I had recovered from this stupor of astonishment, were those of being swept away by the foaming mountains, bubbling, seething in the huge caldron at my feet; of being on the point of losing the sense of hearing, for my temerity in venturing to pry so nearly into the unattainable mysteries of nature; and of instant annihilation from the mass of overhanging black and beetling rock above my head, at an absolute height of nearly 200 feet. In fact, I experienced the same sensations so beautifully described by Shakspeare in 'Lear,' but from a reverse cause; so true is it that extremes meet. I became giddy and confounded by looking at and up to the dizzy scene, instead of glancing from the eye down towards an unfathomable abyss of air and water below. There are few visitors who venture to the 'imminent deadly breach' of the edge of the caldron, and of the Split Rainbow Rock. These form a huge mass, buried cables deep in the gulf, fallen headlong from above, rent by the fall in twain nearly to its base, wedged into the lip of the caldron, and towering 20 or 30 feet above the mountain surge. How it became so transfixed baffles conjecture, for it was evidently hurled from the table-rock above. This Rainbow Rock as it is called, or Iris's Throne, from the extremity of the arc appearing to rest upon it when you view the great fall from the rocky table above, cannot now be approached so easily. The ladder by which, at much personal hazard, its flat and slippery surface was gained, has been swept away by the raging flood; and it is, perhaps, fortunate that it is so, for the experiment of gaining and standing on the surface was attended with great risk. I saw one person, whilst I was sketching the scene, actually lying down at full length upon the edge of it, with his head projected over, to look into the very caldron. I shuddered at the hardihood displayed, for a false movement would be inevitable and instant destruction on that slippery platform. When he descended the ladder I told him what I had felt, and he was fully aware of his danger, but said, that from his childhood he had been a ranger in the Alps. To add to the difficulties of your situation on the edge of the caldron, the descending and ascending spray is so great, that you are wet through very soon; whilst the clouds of arrowy sleet driving in your eyes render

ing not very pleasant; whilst, to add to your
of ideas, you behold a truly Freischutz display,
awling at your feet, amidst a mass of ground
intered timber, bones, and shivered rock, are
thsome and large black toad, the hideously-
ed black lizard, eels of a most equivocal ap-
ce, and even that prototype of the eel, the
lack water-serpent."—*Bonnycastle's Canadas.*

CHAP. XV.

E OCEAN IN GENERAL; AND OF ITS SALTNESS.

look upon a map of the world, we shall
hat the ocean occupies considerably more
globe, than the land is found to do. This
se body of waters is diffused round both
ld and New Continent, to the south;
ay surround them also to the north, for
we know, but the ice in those regions has
d our inquiries. Although the ocean,
ly speaking, is but one extensive sheet of
, continued over every part of the globe,
t interruption, and although no part of it is
d from the rest, yet geographers have dis-
shed it by different names; as, the Atlan-
Western ocean, the Northern ocean, the
ern ocean, the Pacific ocean, and the In-
cean. Others have divided it differently,
ven other names, as the Frozen ocean, the
r ocean, or the American ocean. But all
being arbitrary distinctions, and not of
e's making, the naturalist may consider
with indifference.

his vast receptacle, almost all the rivers of
rth ultimately terminate; nor do such
supplies seem to increase its stores; for it
her apparently swollen by their tribute,
inished by their failure; it still continues
ne. Indeed, what is the quantity of water
he rivers and lakes in the world, compared
t contained in this great receptacle?[1] If
uld offer to make a rude estimate, we shall
at all the rivers in the world, flowing into
d of the sea, with a continuance of their
t stores, would take up at least eight hun-
ears to fill it to its present height. For,
ing the sea to be eighty-five millions of
miles in extent, and a quarter of a mile,
n average, in depth, this, upon calculation,
ve about twenty-one millions of cubic miles
er, as the contents of the whole ocean.
o estimate the quantity of water which all
ers supply, take any one of them; the Po,
tance, the quantity of whose discharge into
is known to be one cubic mile of water in
-six days. Now it will be found, upon a
omputation, from the quantity of ground,
, with its influent streams, covers, that all
ers of the world furnish about two thousand times that quantity of water. In the space of a year, therefore, they will have discharged into the sea about twenty-six thousand cubic miles of water; and not till eight hundred years will they have discharged as much water as is contained in the sea at present. I have not troubled the reader with the odd numbers, lest he should imagine I was giving precision to a subject that is incapable of it.

Thus great is the assemblage of waters diffused round our habitable globe; and yet, immeasurable as they seem, they are mostly rendered subservient to the necessities and the conveniences of so little a being as man. Nevertheless, if it should be asked whether they be made for him alone, the question is not easily resolved. Some philosophers have perceived so much analogy to man in the formation of the ocean, that they have not hesitated to assert its being made for him alone. The distribution of land and water,[2] say they, is admirable; the one being laid against the other so skilfully, that there is a just equipoise of the whole globe. Thus the Northern ocean balances against the Southern; and the New Continent is an exact counterweight to the Old. As to any objection from the ocean's occupying too large a share of the globe, they contend, that there could not have been a smaller surface employed to supply the earth with a due share of evaporation. On the other hand, some take the gloomy side of the question; they either magnify[3] its apparent defects; or assert, that what seems defects to us, may be real beauties to some wiser order of beings.[4] They observe, that multitudes of animals are concealed in the ocean, and but a small part of them are known; the rest, therefore, they fail not to say, were certainly made for their own benefit, and not for ours. How far either of these opinions be just, I will not presume to determine; but of this we are certain, that God has endowed us with abilities to turn this great extent of waters to our own advantage. He has made these things, perhaps, for other uses; but he has given us faculties to convert them to our own. This much agitated question, therefore, seems to terminate here. We shall never know whether the things of this world have been made for our use; but we very well know that we have been made to enjoy them. Let us then boldly affirm, that the earth and all its wonders are ours; since we are furnished with powers to force them into our service. Man is the lord of all the sublunary creation; the howling savage, the winding serpent, with all the untameable and rebellious offspring of Nature, are destroyed in the contest, or driven at a distance from his habitations. The extensive and tempestuous ocean, instead of limiting or dividing his power, only serves to assist his industry, and enlarge the sphere of his enjoyments. Its billows and its monsters, instead of presenting a scene of terror, only call up the courage of this little intrepid being; and the greatest danger that man now fears on the deep, is from his fellow-creatures. Indeed, when I consider the human race as Nature has formed them, there is but very little of the habitable globe that seems made for them. But when I consider them as accumulating the experience of ages, in commanding the earth, there is nothing so great or so terrible. What a poor contemptible being is the naked savage, standing on the beach of the ocean, and trembling at its tumults! How little capable is he of converting its terrors into benefits; or of saying, Behold an element made wholly for my enjoyment! He considers it as an angry deity, and pays it the homage of submission. But it is very different when he has exercised his mental powers; when he has learned to find his own superiority, and to make it subservient to his commands. It is then that his dignity begins to appear, and that the true Deity is justly praised for having been mindful of man; for having given him the earth for his habitation, and the sea for an inheritance.

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[1] Buffon, vol. ii. p. 70.

[2] Derham's Physico-Theol.

[3] Burnet's Theory, *passim.*

[4] Pope's Ethic Epistles, *passim.*

This power which man has obtained over the ocean, was at first enjoyed in common; and none pretended to a right in that element where all seemed intruders. The sea, therefore, was open to all, till the time of the emperor Justinian. His successor Leo granted such as were in possession of the shore, the sole right of fishing before their respective territories. The Thracian Bosphorus was the first that was thus appropriated; and from that time it has been the struggle of most of the powers of Europe to obtain an exclusive right in this element. The republic of Venice claims the Adriatic. The Danes are in possession of the Baltic. But the English have a more extensive claim to the empire of all the seas encompasing the kingdoms of England, Scotland, and Ireland; and although these have been long contested, yet they are now considered as their indisputable property. Every one knows that the great power of the nation is exerted on this element; and that the instant England ceases to be superior upon the ocean, its safety begins to be precarious.

It is in some measure owing to our dependence upon the sea, and to our commerce there, that we are so well acquainted with its extent and figure. The bays, gulfs, currents, and shallows of the ocean, are much better known and examined than the provinces and kingdoms of the earth itself. The hopes of acquiring wealth by commerce, has carried man to much greater length than the desire of gaining information could have done. In consequence of this, there is scarce a strait or a harbour, scarce a rock or a quicksand, scarce an inflexion of the shore, or the jutting of a promontory, that has not been minutely described. But as these present very little entertainment to the imagination, or delight to any but those whose pursuits are lucrative, they need not be dwelt upon here. While the merchant and the mariner are solicitous in describing currents and soundings, the naturalist is employed in observing wonders, though not so beneficial, yet to him of a much more important nature. The saltness of the sea seems to be foremost.

Whence the sea has derived that peculiar bitterish saltness which we find in it, appears, by Aristotle, to have exercised the curiosity of naturalists in all ages. He supposed (and mankind were for ages content with the solution) that the sun continually raised dry saline exhalations from the earth, and deposited them upon the sea; and hence, say his followers, the waters of the sea are more salt at top than at bottom. But, unfortunately for this opinion, neither of the facts is true. Sea-salt is not to be raised by the vapours of the sun; and sea-water is not salter at the top than at the bottom. Father Bohours is of opinion that the Creator gave the waters of the ocean their saltness at the beginning: not only to prevent their corruption, but to enable them to bear great burthens. But their saltness does not prevent their corruption: for stagnant sea-water, like fresh, soon grows putrid: and, as for their bearing greater burthens, fresh water answers all the purposes of navigation quite as well. The established opinion, therefore, is that of Boyle,[5] who supposes, "That the sea's saltness is supplied not only from rocks or masses of salt at the bottom of the sea, but also from the salt which the rains, and rivers, and other waters, dissolve in their passage through many parts of the earth, and at length carry with them to the sea." But as there is a difference in the taste of rock-salt found at land, and that dissolved in the waters of the ocean, this may be produced by the plenty of nitrous and bituminous bodies that, with the salts, are likewise washed into that great receptacle. These substances being thus once carried to the sea, must for ever remain there; for they do not rise by evaporation so as to be returned back from whence they came. Nothing but the fresh waters of the sea rise in vapours; and all the saltness remains behind. From hence it follows, that every year the sea must become more and more salt; and this speculation Dr. Halley carries so far as to lay down a method of finding out the age of the world by the saltness of its waters. "For if it be observed," says he, "what quantity of salt is at present contained in a certain weight of water taken up from the Caspian sea, for example, and, after some centuries what greater quantity of salt is contained in the same weight of water, taken from the same place; we may conclude, that in proportion as the saltness has increased in a certain time, so much must it have increased before that time; and we may thus by the rule of proportion make

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[5] Boyle, vol. iii. p. 221.

stimate of the whole time wherein the water
ld acquire the degree of saltness it should
be possessed of."[6] All this may be fine:
ever, an experiment, begun in this century,
h is not to be completed till some centuries
e, is rather a little mortifying to modern
osity; and I am induced to think, the inhab-
ts round the Caspian sea will not be apt to
rtake the inquiry.

is saltness is found to prevail in every part
e ocean; and as much at the surface as at
bottom. It is also found in all those seas
communicate with the ocean; but rather
less degree.

e great lakes, likewise, that have no outlets
communication with the ocean, are found to
alt; but some of them in less proportion.
the contrary, all those lakes through which
rs run into the sea, however extensive they
are, notwithstanding, very fresh: for the
rs do not deposite their salts in the bed of
lake, but carry them with their currents into
ocean. Thus the lakes Ontario and Erie, in
th America, although for magnitude they
be considered as inland seas, are neverthe-
fresh-water lakes; and kept so by the river
Lawrence, which passes through them. But
e lakes that have no communication with the
nor any rivers going out, although they be
than the former, are, however, always salt.
s, that which goes by the name of the Dead
though very small when compared to those
ady mentioned, is so exceedingly salt, that
waters seem scarcely capable of dissolving
more. The lakes of Mexico and of Titicaca
Peru, though of no great extent, are never-
ess salt; and both for the same reason.

hose who are willing to turn all things to the
, have not failed to consider this saltness of
sea as a peculiar blessing from providence,
rder to keep so great an element sweet and
lesome. What foundation there may be in
remark, I will not pretend to determine; but
hall shortly find a much better cause for its
g kept sweet, namely, its motion.

n the other hand, there have been many who
e considered the subject in a different light,
have tried every endeavour to make salt-
er fresh, so as to supply the wants of mariners
long voyages, or when exhausted of their
nary stores. At first it was supposed simple
illation would do; but it was soon found,
the bitter part of the water still kept mixed.
as then tried by uniting salt of tartar with
water, and distilling both, but here the ex-
se was greater than the advantage. Calcined
es were next thought of; but a hogshead of
ined bones, carried to sea, would take up as
h room as a hogshead of water, and was
e hard to be obtained. In this state, there-
, have the attempts to sweeten sea-water
rested; the chemist, satisfied with the reality of his invention, and the mariner convinced of its being useless. I cannot, therefore, avoid mentioning a kind of succedaneum which has been lately conceived to answer the purposes of fresh water, when mariners are quite exhausted. It is well known, that persons who go into a warm bath, come out several ounces heavier than they went in; their bodies having imbibed a correspondent quantity of water. This more particularly happens, if they have been previously debarred from drinking, or go in with a violent thirst; which they quickly find quenched, and their spirits restored. It was supposed, that in case of a total failure of fresh water at sea, a warm bath might be made of sea-water, for the use of mariners; and that their pores would thus imbibe the fluid without any of its salts, which would be seen to crystallize on the surface of their bodies. In this manner it is supposed, a sufficient quantity of moisture may be procured to sustain life, till time or accident furnish a more copious supply.

But however this be, the saltness of the sea can by no means be considered as a principal cause in preserving its waters from putrefaction. The ocean has its currents, like rivers, which circulate its contents round the globe; and these may be said to be the great agents that keep it sweet and wholesome. Its saltness alone would by no means answer this purpose: and some have even imagined that the various substances with which it is mixed, rather tend to promote putrescence than impede it. Sir Robert Hawkins, one of our most enlightened navigators, gives the following account of a calm in which the sea, continuing for some time without motion, began to assume a very formidable appearance. "Were it not," says he, "for the moving of the sea, by the force of winds, tides, and currents, it would corrupt all the world. The experiment of this I saw in the year 1590, lying with a fleet about the islands of the Azores, almost six months; the greatest part of which time we were becalmed. Upon which all the sea became so replenished with several sorts of jellies, and forms of serpents, adders, and snakes, as seemed wonderful: some green, some black, some yellow, some white, some of divers colours; and many of them had life; and some there were a yard and a half, and two yards long: which had I not seen, I could hardly have believed. And hereof are witnesses all the company of the ships which were then present; so that hardly a man could draw a bucket of water clear of some corruption. In which voyage towards the end thereof, many of every ship fell sick, and began to die apace. But the speedy passage into our country was a remedy to the crazed, and a preservative for those that were not touched."

This shows abundantly how little the sea's saltness was capable of preserving it from putrefaction: but to put the matter beyond all doubt,

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[6] Phil. Trans. vol. v. p. 218.

Mr. Boyle kept a quantity of sea-water, taken up in the English Channel, for some time barrelled up; and in the space of a few weeks it began to acquire a fetid smell.[7] He was also assured, by one of his acquaintance, who was becalmed for twelve or fourteen days in the Indian sea, that the water, for want of motion, began to stink; and that had it continued much longer, the stench would probably have poisoned him. It is the motion, therefore, and not the saltness of the sea, that preserves it in its present state of salubrity; and this, very probably, by dashing and breaking in pieces the rudiments, if I may so call them, of the various animals that would otherwise breed there, and putrefy.

There are some advantages, however, which are derived from the saltness of the sea. Its waters being evaporated, furnish that salt which is used for domestic purposes; and although in some places it is made from springs, and in others dug out of mines, yet the greatest quantity is made only from the sea. That which is called *bay salt*, (from its coming to us by the Bay of Biscay,) is a stronger kind, made by evaporation in the sun; that called *common salt*, is evaporated in pans over the fire, and is of a much inferior quality to the former.

Another benefit arising from the quantity of salt dissolved in the sea is, that it thus becomes heavier, and consequently more buoyant. Mr. Boyle, who examined the difference between sea-water and fresh, found that the former appeared to be about a forty-fifth part heavier than the latter. Those, also, who have had opportunities of bathing in the sea, pretend to have experienced a much greater ease in swimming there than in fresh water. However, as we see they have only a forty-fifth part more of their weight sustained by it, I am apt to doubt whether so minute a difference can be practically perceivable. Be this as it may, as sea-water alters in its weight from fresh, so it is found also to differ from itself in different parts of the ocean. In general it is perceivable to be heavier, and consequently salter, the nearer we approach the line.[8]

But there is an advantage arising from the saltness of the waters of the sea, much greater than what has been yet mentioned; which is, that their congelation is thus retarded. Some indeed have gone so far as to say, that sea-water never freezes;[9] but this is an assertion contradicted by experience. However, it is certain that it requires a much greater degree of cold to freeze it than fresh water; so that while rivers and springs are seen converted into one solid body of ice, the sea is always fit for navigation, and no way affected by the coldness of the severest winter. It is, therefore, one of the greatest blessings we derive from this element, that, when at land all the stores of nature are locked up from us, we find the sea ever open to our necessities, and patient of the hand of industry.

But it must not be supposed, because in our temperate climate we never see the sea frozen, that it is in the same manner open in every part of it. A very little acquaintance with the accounts of mariners must have informed us, that at the polar regions it is embarrassed with mountains and moving sheets of ice, that often render it impassable. These tremendous floats are of different magnitudes; sometimes rising more than a thousand feet above the surface of the water;[10] sometimes diffused into plains of above two hundred leagues in length; and, in many parts, sixty or eighty broad. They are usually divided by fissures; one piece following another so close, that a person may step from one to the other. Sometimes mountains are seen rising amidst these plains, and presenting the appearance of a variegated landscape, with hills and valleys, houses, churches, and towers. These are appearances in which all naturalists are agreed; but the great contest is respecting their formation. Mr. Buffon asserts,[11] that they are formed from fresh water alone, which congealing at the mouths of great rivers, accumulate those huge masses that disturb navigation. However, this great naturalist seems not to have been aware, that there are two sorts of ice floating in these seas; the flat ice and the mountain ice: the one formed of sea-water only; the other of fresh.[12]

The flat, or driving ice, is entirely composed of sea-water; which, upon dissolution, is found to be salt; and is readily distinguished from the mountain, or fresh-water ice, by its whiteness and want of transparency. This ice is much more terrible to mariners than that which rises up in lumps: a ship can avoid the one, as it is seen at a distance; but it often gets in among the other, which, sometimes closing, crushes it to pieces. This, which evidently has a different origin from the fresh-water ice, may perhaps have been produced in the Icy sea, beneath the pole; or along the coasts of Spitzbergen or Nova-Zembla.

The mountain ice, as was said, is different in every respect, being formed of fresh water, and appearing hard and transparent; it is generally of a pale green colour, though some pieces are of a beautiful sky-blue; many large masses also appear gray, and some black. If examined more nearly, they are found to be incorporated with earth, stones, and brush-wood, washed from the shore. On these also are sometimes found, not only earth, but nests with birds' eggs, at several hundred miles from land. The generality of these, though almost totally fresh, have nevertheless a thick crust of salt-water frozen upon them, probably from the power that ice has sometimes to produce ice. Such mountains as are here described, are most usually seen at spring-time, and after a violent storm, driving out to sea, where they at first terrify the mariner, and are soon after dashed to pieces by the continual washing of the waves; or driven into the warmer regions of the south, there to be melted away. They sometimes, however, strike back upon their native shores, where they seem to take root at the feet of mountains; and, as Martius tells us, are sometimes higher than the mountains themselves. Those seen by him were blue, full of clefts and cavities made by the rain, and crowned with snow, which alternately thawing and freezing every year, augmented their size. These, composed of materials more solid than that driving at sea, presented a variety of agreeable figures to the eye, that with a little help from fancy assumed the appearance of trees in blossom; the inside of churches, with arches, pillars, and windows; and the blue-coloured rays, darting from within, presented the resemblance of a glory.

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[7] Boyle, vol. iii. p. 222.

[8] Phil. Trans. vol. ii. p. 297.—The quantity of saline ingredients in the waters of the ocean varies from 1-10th to 1-50th part: Mr. Kirwan makes the average about 1-28th. The quantity, however, varies, even in the same latitude, during the rainy and dry seasons, and according to the distance from land and the mouths of great rivers.—Ed.

[9] Macrobius.

[10] Crantz's History of Greenland, vol. i. p. 31.

[11] Buffon, vol. ii. p. 91.

[12] Crantz.

If we inquire into the origin and formation of these, which, as we see, are very different from the former, I think we have a very satisfactory account of them in Crantz's History of Greenland; and I will take leave to give the passage with a very few alterations. "These mountains of ice," says he, "are not salt, like the sea-water, but sweet; and, therefore, can be formed nowhere except on the mountains, in rivers, in caverns, and against the hills near the sea-shore. The mountains of Greenland are so high that the snow which falls upon them, particularly on the north side, is in one night's time wholly converted into ice: they also contain clefts and cavities, where the sun seldom or never injects his rays; besides these, are projections, or landing-places, on the declivities of the steepest hills, where the rain and snow-water lodge, and quickly congeal. When now the accumulated flakes of snow slide down, or fall with the rain from the eminences above on these prominences; or, when here and there a mountain-spring comes rolling down to such a lodging-place, where the ice has already seated itself, they all freeze, and add their tribute to it. This, by degrees, waxes to a body of ice, that can no more be overpowered by the sun; and which, though it may indeed, at certain seasons, diminish by a thaw, yet, upon the whole, through annual acquisitions, it assumes an annual growth. Such a body of ice is often prominent far over the rocks. It does not melt on the upper surface, but underneath; and often cracks into many larger or smaller clefts, from whence the thawed water trickles out. By this it becomes at last so weak, that being overloaded with its own ponderous bulk, it breaks loose, and tumbles down the rocks with a terrible crash. Where it happens to overhang a precipice on the shore, it plunges into the deep with a shock like thunder; and with such an agitation of the water, as will overset a boat at some distance, as many a poor Greenlander has fatally experienced." Thus are these amazing ice-mountains launched forth to sea, and found floating in the waters round both the poles. It is these that have hindered mariners from discovering the extensive countries that lie round the south pole; and that probably block up the passage to China by the north.

I will conclude this chapter with one effect more, produced by the saltness of the sea; which is the luminous appearance of its waves in the night. All who have been spectators of a sea by night, a little ruffled with winds, seldom fail of observing its fiery brightness. In some places it shines as far as the eye can reach;[13] at other times, only when the waves boom against the side of the vessel, or the oar dashes into the water. Some seas shine often; others more seldom; some, ever when particular winds blow; and others, within a narrow compass; a long tract of light being seen along the surface, whilst all the rest is hid in total darkness. It is not easy to account for these extraordinary appearances: some have supposed that a number of luminous insects produced the effect, and this is in reality sometimes the case; in general, however, they have every resemblance to that light produced by electricity; and, probably, arise from the agitation and dashing of the saline particles of the fluid against each other. But the manner in which this is done—for we can produce nothing similar by any experiments hitherto made—remains for some happier accident to discover. Our progress in the knowledge of nature is slow; and it is a mortifying consideration, that we are hitherto more indebted for success to chance than industry.[14]

[13] Boyle, vol. i. p. 294.

[14] NOTE.—*Luminous appearance of the Sea.*

The luminous appearance of the sea is a phenomenon which seamen generally regard as the precursor of blowing weather. It is of most frequent occurrence in summer and autumn. Forster distinguishes three species of marine phosphorescence. The first is generally seen close to a ship when sailing before a fresh wind, and forms a tail of light in the wake of the ship. At other times, during stormy weather, it spreads over the whole surface of the sea, clothing it apparently in a sheet of fire: this species he ascribes to electricity. The second kind of marine phosphorescence penetrates beneath the surface; and when a quantity of the illuminated water is put into a vessel, it retains the brilliance as long as it is kept agitated, but loses it as soon as the agitation subsides: this species occurs during dead calms or in very hot weather, and seems to be a true phosphoric light, emanating from particles of putrid animal matter suspended in the water. The third species exceeds the two former in intensity of brilliance; and Forster having attentively examined some of the shining water, expresses his conviction that the appearance is occasioned by innumerable minute animals of a round shape, moving rapidly through the water in all directions, like so many luminous sparks. He imagines that these small gelatinous specks may be the young fry of certain species of some medusæ or blubber. M. Dagilet and M. Rigaud observed several times, and in different parts of the ocean, such luminous appearances attended by vast masses of different animalculæ; and a few days after, the sea was covered near the coasts, with whole banks of small fish in innumerable multitudes, which they supposed had proceeded from the shining animalculæ. But M. le Roi, after giving much attention to this phenomenon, concludes, that it is not occasioned by any shining insects, especially, as, after carefully examining with a microscope some of the luminous points, he found them to have no appearance of an animal; he also found, that the mixture of a little spirit of wine with water just drawn from the sea, would give the appearance of a great number of little sparks, which would continue visible longer than those in the ocean. The same effect was produced by all the acids, and various other liquids.

CHAP. XVI.

OF THE TIDES, MOTION, AND CURRENTS, OF THE SEA; WITH THEIR EFFECTS.

It was said in the former chapter, that the waters of the sea were kept sweet by their motion; without which they would soon putrefy, and spread universal infection. If we look for final causes, here indeed we have a great and an obvious one that presents itself before us. Had the sea been made without motion, and resembling a pool of stagnant water, the nobler races of animated nature would shortly be at an end. Nothing would then be left alive but swarms of ill-formed creatures, with scarcely more than vegetable life; and subsisting by putrefaction. Were this extensive bed of waters entirely quiescent, millions of the smaller reptile kinds would there find a proper retreat to breed and multiply in; they would find there no agitation, no concussion in the parts of the fluid to crush their feeble frames, or to force them from the places where they were bred: there they would multiply in security and ease, enjoy a short life, and putrefying, thus again give nourishment to numberless others, as little worthy of existence as themselves. But the motion of this great element effectually destroys the number of these viler creatures; its currents and its tides produce continual agitations, the shock of which they are not able to endure; the parts of the fluid rubbing against each other destroy all viscidities; and the ocean, if I may so express it, acquires health by exercise.

The most obvious motion of the sea, and the most generally acknowledged, is that of its tides. This element is observed to flow for certain hours from the south toward the north; in which motion or flux, which lasts about six hours, the sea gradually swells; so that entering the mouths of rivers, it drives back the river-waters to their heads. After a continual flux of six hours, the sea seems to rest for a quarter of an hour; and then begins to ebb, or retire back again, from north to south, for six hours more; in which time the waters sinking, the rivers resume their natural course. After a seeming pause of a quarter of an hour, the sea again begins to flow as before: and thus it has alternately risen and fallen, twice a-day, since the creation.

This amazing appearance did not fail to excite the curiosity, as it did the wonder of the ancients. After some wild conjectures of the earliest philosophers, it became well known in the time of Pliny, that the tides were entirely under the influence, in a small degree, of the sun; but in a much greater of the moon. It was found that there was a flux and reflux of the sea, in the space of twelve hours fifty minutes, which is exactly the time of a lunar day. It was observed, that whenever the moon was in the meridian, or, in other words, as nearly as possible over any part of the sea, that the sea flowed to that part, and made a tide there; on the contrary, it was found, that when the moon left the meridian, the sea began to flow back again from whence it came; and there might be said to ebb. Thus far the waters of the sea seemed very regularly to attend the motions of the moon. But as it appeared, likewise, that when the moon was in the opposite meridian, as far off on the other side of the globe, that there was a tide on this side also; so that the moon produced two tides, one by her greatest approach to us, and another by her greatest distance from us: in other words, the moon, in once going round the earth, produced two tides, always at the same time; one on the part of the globe directly under her, and the other on the part of the globe directly opposite.

Mankind continued for several ages content with knowing the general cause of these wonders, hopeless of discovering the particular manner of the moon's operation. Kepler was the first who conjectured that attraction was the principal cause; asserting, that the sphere of the moon's operation extended to the earth, and drew up its waters. The precise manner in which this is done, was discovered by Newton.

The moon has been found, like all the rest of the planets, to attract and to be attracted by the earth. This attraction prevails throughout our whole planetary system. The more matter there is contained in any body, the more it attracts; and its influence decreases in proportion as the distance, when squared, increases. This being premised, let us see what must ensue upon supposing the moon in the meridian of any tract of the sea. The surface of the water immediately under the moon, is nearer the moon than any other part of the globe is; and, therefore, must be more subject to its attraction than the waters anywhere else. The waters will, therefore, be attracted by the moon, and rise in a heap; whose eminence will be the highest where the attraction is greatest. In order to form this eminence, it is obvious that the surface, as well as the depths, will be agitated; and that, wherever the water runs from one part, succeeding waters must run to fill up the space it has left. Thus the waters of the sea, running from all parts to attend the motions of the moon, produce the flowing of the tide; and it is high tide at that part wherever the moon comes over it, or to its meridian.

But when the moon travels onward, and ceases to point over the place where the waters were just risen, the cause here of their rising ceasing to operate, they will flow back by their natural gravity into the lower parts from whence they had travelled; and this retiring of the waters will form the ebbing of the sea.

Thus the first part of the demonstration is obvious; since, in general, it requires no great sagacity to conceive that the waters nearest the moon are most attracted, or raised highest by the moon. But the other part of the demonstration, namely, how there come to be high tides at the same time, on the opposite side of the globe, and where the waters are farthest from the moon, is not so easy to conceive. To comprehend this, it must be observed, that the part of the earth and its waters that are farthest from the moon, are the parts of all others that are least attracted by the moon; it must also be observed, that all the waters, when the moon is on the opposite side of the earth, must be attracted by it in the same direction that the earth itself attracts them; that is, if I may so say, quite through the body of the earth, towards the moon itself. This, therefore, being conceived, it is plain that those waters which are farthest from the moon, will have less weight than those of any other part, on the same side of the globe; because the moon's attraction, which conspires with the earth's attraction, is there least. Now, therefore, the waters farthest from the moon, having less weight, and being lightest, will be pressed on all sides, by those that, having more attraction, are heavier: they will be pressed, I say, on all sides; and the heavier waters flowing in, will make them swell and rise, in an eminence directly opposite to that on the other side of the globe, caused by the more immediate influence of the moon.

In this manner the moon, in one diurnal revolution, produces two tides; one raised immediately under the sphere of its influence, and the other directly opposite to it. As the moon travels, this vast body of waters rears upward, as if to watch its motions; and pursues the same constant rotation. However, in this great work of raising the tides, the sun has no small share; it produces its own tides constantly every day, just as the moon does, but in a much less degree, because the sun is at an immensely greater distance. Thus there are solar tides, and lunar tides. When the forces of these two great luminaries concur, which they always do when they are either in the same, or in opposite parts of the heavens, they jointly produce a much greater tide, than when they are so situated in the heavens, as each to make peculiar tides of their own. To express the very same thing technically; in the conjunctions and oppositions of the sun and moon, the attraction of the sun conspires with the attraction of the moon; by which means the high spring-tides are formed. But in the quadratures of the sun and moon, the water raised by the one is depressed by the other; and hence the lower neap-tides have their production. In a word, the tides are greatest in the syzigies, and least in the quadratures.[1]

This theory well understood, and the astronomical terms previously known, it may readily be brought to explain the various appearances of the tides, if the earth were covered with a deep sea, and the waters uninfluenced by shoals, currents, straits, or tempests. But in every part of the sea, near the shores, the geographer must come in to correct the calculations of the astronomer. For, by reason of the shallowness of some places, and the narrowness of the straits in others, there arises a great diversity in the effect, not to be accounted for without an exact knowledge of all the circumstances of the place. In the great depths of the ocean, for instance, a very slow and imperceptible motion of the whole body of water will suffice to raise its surface several feet high; but if the same increase of water is to be conveyed through a narrow channel, it must rush through it with the most impetuous rapidity. Thus, in the English channel, and the German ocean, the tide is found to flow strongest in those places that are narrowest; the same quantity of water being, in this case, driven through a smaller passage. It is often seen therefore, pouring through a strait with great force; and, by its rapidity, considerably raised above the surface of that part of the ocean into which it runs.

This shallowness and narrowness in many parts of the sea, give also rise to a peculiarity in the tides of some parts of the world. For in many places, and in our own seas in particular, the greatest swell of the tide is not while the moon is in its meridian height, and directly over the place, but some time after it has declined from thence. The sea, in this case, being obstructed, pursues the moon with what despatch it can, but does not arrive with all its waters till long after the moon has ceased to operate. Lastly, from this shallowness of the sea, and from its being obstructed by shoals and straits, we may account for the Mediterranean, the Baltic, and the Black sea, having no sensible tides. These, though to us they seem very extensive, are not however large enough to be affected by the influence of the moon; and as to their communication with the ocean, through such narrow inlets, it is impossible, in a few hours' time, that they should receive and return water enough to raise or depress them in any considerable degree.

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[1] The connexion between the motion of the sea, and the position of the moon, was early observed by philosophers. Pythias, Pliny, Ptolemy, and Macrobius, mention the influence of the sun and moon upon the tides. Among the moderns, Galileo, Descartes, Kepler, Newton, and others, have offered hypotheses upon this subject; and the succeeding observations of Bernoulli, Euler, and La Place, have proved that these oscillations of the sea are of three kinds, viz. those which depend solely on the motion of the sun and moon in their respective orbits, and on the place of the moon's nodes; those which depend principally on the rotation of the globe; and those which depend on an angle which is double the angular rotation of the earth. The first class vary periodically, but slowly, so that they do not return in the same order till after a very long period of time. The second class return in the same order after the interval of a day nearly. The third class return after the interval of nearly half-a-day. Each of these classes of oscillations proceed just as if the other two had no existence.—ED.

In general, therefore, we may observe, that all tides are much higher, and more considerable, in the torrid zone, than in the rest of the ocean; the sea in those parts being generally deeper, and less affected by changeable winds, or winding shores.[2] The greatest tide we know of, is that at the mouth of the river Indus, where the water rises thirty feet in height. How great, therefore, must have been the amazement of Alexander's soldiers at so strange an appearance! They who always before had been accustomed only to the scarcely perceptible risings of the Mediterranean, or the minute intumescence of the Black sea, when made at once spectators of a river rising and falling thirty feet in a few hours, must, no doubt, have felt the most extreme awe, and, as we are told,[3] a mixture of curiosity and apprehension. The tides are also remarkably high on the coasts of Malay, in the straits of Sunda, in the Red sea, at the mouth of the river St. Lawrence, along the coasts of China and Japan, at Panama, and in the gulf of Bengal. The tides at Tonquin, however, are the most remarkable in the world. In this part there is but one tide, and one ebb, in twenty-four hours; whereas, as we have said before, in other places there are two. Besides, there, twice in each month, there is no tide at all, when the moon is near the equinoctial, the water being for some time stagnant. These, with some other odd appearances attending the same phenomena, were considered by many as inscrutable; but Sir Isaac Newton, with peculiar sagacity, adjudged them to arise from the concurrence of two tides, one from the South sea, and the other from the Indian ocean. Of each of these tides there come successively two every day; two at one time greater, and two at another that are less. The time between the arrival of the two greater, is considered by him as high tide; the time between the two lesser, as ebb. In short, with this clue, that great mathematician solved every appearance, and so established his theory as to silence every opposer.

This fluctuation of the sea, from the tides, produces another, and more constant rotation of its waters, from the east to the west, in this respect following the course of the moon. This may be considered as one great and general current of the waters of the sea; and although it be not everywhere distinguishable, it is nevertheless everywhere existent, except when opposed by some particular current or eddy, produced by partial and local causes. This tendency of the sea towards the west, is plainly perceivable in all the great straits of the ocean; as, for instance, in those of Magellan, where the tide running in the east, rises twenty feet high, and continues flowing six hours; whereas the ebb continues but two hours, and the current is directed to the west. This proves that the flux is not equal to the reflux: and that from both results a motion of the sea westward, which is more powerful during the time of the flux than the reflux.

But this motion westward has been sensibly observed by navigators, in their passage back from India to Madagascar, and so on to Africa. In the great Pacific ocean also it is very perceivable; but the places where it is most obvious, are, as was said, in those straits which join one ocean to another. In the straits between the Maldivia islands, in the gulf of Mexico, between Cuba and Jucatan. In the straits of the gulf of Paria, the motion is so violent, that it hath received the appellation of the Dragon's Mouth. Northward, in the sea of Canada, in Waigat's straits, in the straits of Java, and, in short, in every strait where the ocean on one part pours into the ocean on the other. In this manner, therefore, is the sea carried with an unceasing circulation round the globe; and at the same time that its waters are pushed backward and forward with the tide, they have thus a progressive current to the west, which though less observable, is not the less real.

Beside these two general motions of the sea, there are others which are particular to many parts of it, and are called currents. These are found to run in all directions, east, west, north, and south; being formed, as was said above, by various causes; the prominence of the shores, the narrowness of the straits, the variations of the wind, and the inequalities at the bottom. These, though no great object to the philosopher, as their causes are generally local and obvious, are nevertheless of the most material consequence to the mariner; and without a knowledge of which he could never succeed. It often has happened, that when a ship has unknowingly got into one of these, every thing seems to go forward with success, the mariners suppose themselves every hour approaching their wished-for port, the wind fills their sails, and the ship's prow seems to divide the water; but, at last, by miser-ble experience they find that, instead of going orward, they have been all the time receding. he business of currents, therefore, makes a coniderable article in navigation; and the direction f their stream, and their rapidity, has been careully set down. This some do by the observation f the surface of the current; or by the driving f the froth along the shore; or by throwing out hat is called the *log-line*, with a buoy made for hat purpose, and by the direction and motion f this, they judge of the setting and the rapidity f the current.

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[2] Buffon, vol. ii. p. 187.

[3] Quintus Curtius.

These currents are generally found to be most iolent under the equator, where indeed all the otions of the ocean are most perceivable. Along he coasts of Guinea, if a ship happens to overhoot the mouth of any river it is bound to, the urrent prevents its return; so that it is obliged o steer out to sea, and take a very large comass, in order to correct the former mistake. hese set in a contrary direction to the general otion of the sea westward; and that so strongly, hat a passage which, with the current, is made n two days, is with difficulty performed in six eeks against it. However, they do not extend bove twenty leagues from the coast; and ships oing to the East Indies, take care not to come ithin the sphere of their action. At Sumatra, he currents, which are extremely rapid, run rom south to north; there are also strong curents between Madagascar and the Cape of Good Hope. On the western coasts of America, the urrent always runs from the south to the north, here a south wind, continually blowing, most robably occasions this phenomenon. But the urrents that are most remarkable, are those ontinually flowing into the Mediterranean sea, oth from the ocean by the straits of Gibraltar, nd at its other extremity, from the Euxine sea y the Archipelago. This is one of the most xtraordinary appearances in nature; this large ea receiving not only the numerous rivers that all into it, such as the Nile, the Rhone, and the Po, but also a very great influx from the Euxine ea on one part, and the ocean on the other. At he same time, it is seen to return none of those aters it is thus known to receive. Outlets runing from it there are none; no rivers but such s bring it fresh supplies; no straits but what re constantly pouring their waters into it: it as, therefore, been the wonder of mankind in very age, how, and by what means, this vast oncourse of waters are disposed of; or how this ea, which is always receiving, and never returnng, is no way fuller than before. In order to ccount for this, some have said, that the water as reconveyed by subterraneous passages into he Red sea.[4] There is a story told of an Arabian alif, who caught a dolphin in this sea; admiring he beauty of which, he let it go again, having reviously marked it by a ring of iron. Some time after a dolphin was caught in the Red sea, and quickly known by the ring to be the same that had been taken in the Mediterranean before. Such, however, as have not been willing to found their opinions upon a story, have attempted to account for the disposal of the waters of the Mediterranean by evaporation. For this purpose they have entered into long calculations upon the extent of its surface, and the quantity of water that would be raised from such a surface in a year. They then compute how much water runs in by its rivers and straits in that time; and find, that the quantity exhausted by evaporation, greatly exceeds the quantity supplied by rivers and seas. This solution, no doubt, would be satisfactory, did not the ocean, and the Euxine, evaporate as well as the Mediterranean; and as these are subject to the same drain, it must follow, that all the seas will in this respect be upon a par; and therefore, there must be some other cause for this unperceived drain, and continual supply. This seems to be satisfactorily enough accounted for by Dr. Smith, who supposes an under current running through the straits of Gibraltar, to carry out as much water into the ocean, as the upper current continually carries in from it. To confirm this, he observes, that nearer home, between the North and South Foreland, the tide is known to run one way at top, and the ebb another way at bottom. This double current he also confirms by an experiment communicated to him by an able seaman, who being with one of the king's frigates in the Baltic, found he went with his boat into the mid-stream, and was carried violently by the current; upon which a basket was sunk, with a large cannon-ball, to a certain depth of water, which gave a check to the boat's motion: as the basket sunk still lower, the boat was driven, by the force of the water below, against the upper current; and the lower the basket was let down, the stronger the under current was found, and the quicker was the boat's motion against the upper stream, which seemed not to be above four fathom deep. From hence we may readily infer, that the same cause may operate at the straits of Gibraltar; and that while the Mediterranean seems replenishing at top, it may be emptying at bottom.

The number of the currents at sea are impossible to be recounted, nor indeed are they always known; new ones are daily produced by a variety of causes, and as quickly disappear. When a regular current is opposed by another in a narrow strait, or where the bottom of the sea is very uneven, a whirlpool is often formed. These were formerly considered as the most formidable obstructions to navigation; and the ancient poets and historians speak of them with terror; they are described as swallowing up ships, and dashing them against the rocks at the bottom: apprehension did not fail to add imaginary terrors to the description, and placed at the centre of the whirlpool a dreadful den fraught with monsters whose howlings served to add new horrors to the dashings of the deep. Mankind at present, however, view these eddies of the sea with very little apprehension; and some have wondered how the ancients could have so much overcharged their descriptions. But all this is very naturally accounted for. In those times when navigation was in its infancy, and the slightest concussion of the waves generally sent the poor adventurer to the bottom, it is not to be wondered at that he was terrified at the violent agitations in one of these. When his little ship, but ill fitted for opposing the fury of the sea, was got within the vortex, there was then no possibility of ever returning. To add to the fatality, they were always near the shore; and along the shore was the only place where this ill-provided mariner durst venture to sail. These were, therefore, dreadful impediments to his navigation; for if he attempted to pass between them and the shore, he was sometimes sucked in by the eddy; and if he attempted to avoid them out at sea, he was often sunk by the storm. But in our time, and in our present improved state of navigation, Charybdis, and the Euripus, with all the other irregular currents of the Mediterranean, are no longer formidable. Mr. Addison, not attending to this train of thinking, upon passing through the straits of Sicily, was surprised at the little there was of terror in the present appearance of Scylla and Charybdis; and seems to be of opinion, that their agitations are much diminished since the times of antiquity. In fact, from the reasons above, all the wonders of the Mediterranean sea are described in much higher colours than they merit, to us who are acquainted with the more magnificent terrors of the ocean. The Mediterranean is one of the smoothest and most gentle seas in the world; its tides are scarcely perceivable, except in the gulf of Venice, and shipwrecks are less known there than in any other part of the world.

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[4] Kircher, Mund. Subt. vol. i.

It is in the ocean, therefore, that these whirlpools are particularly dangerous, where the tides are violent, and the tempests fierce. To mention only one, that called *the Maelstroom*, upon the coasts of Norway, which is considered as the most dreadful and voracious in the world. The name it has received from the natives, signifies *the navel of the sea;* since they suppose that a great share of the water of the sea is sucked up and discharged by its vortex. A minute description of the internal parts is not to be expected, since none who were there ever returned to bring back information. The body of the waters that form this whirlpool, are extended in a circle above thirteen miles in circumference.[5] In the midst of this stands a rock, against which the tide in its ebb is dashed with inconceivable fury. At this time it instantly swallows up all things that come within the sphere of its violence, trees, timber, and shipping. No skill in the mariner, nor strength of rowing, can work an escape; the sailor at the helm finds the ship at first go in a current opposite to his intentions; his vessel's motion, though slow in the beginning, becomes every moment more rapid; it goes round in circles still narrower, and narrower, till at last it is dashed against the rocks, and instantly disappears: nor is it seen again for six hours; till the tide flowing, it is vomited forth with the same violence with which it was drawn in. The noise of this dreadful vortex still farther contributes to increase its terror, which, with the dashing of the waters and the dreadful valley, if it may be so called, caused by their circulation, makes one of the most tremendous objects in nature.

CHAP. XVII.

OF THE CHANGES PRODUCED BY THE SEA UPON THE EARTH.

From what has been said, as well of the earth as of the sea, they both appear to be in continual fluctuation. The earth, the common promptuary that supplies subsistence to men, animals, and vegetables, is continually furnishing its stores to their support. But the matter which is thus derived from it, is soon restored, and laid down again to be prepared for fresh mutations. The transmigration of souls is, no doubt, false and whimsical; but nothing can be more certain than the transmigration of bodies: the spoils of the meanest reptile may go to the formation of a prince; and, on the contrary, as the poet has it, the body of Cæsar may be employed in stopping a beer-barrel. From this, and other causes, therefore, the earth is in continual change. Its internal fires, the deviation of its rivers, and the falling of its mountains, are daily altering its surface; and geography can scarcely recollect the lakes and the valleys that history once described.

But these changes are nothing to the instability of the ocean. It would seem that inquietude was as natural to it as its fluidity. It is first seen with a constant and equable motion going towards the west; the tides then interrupt this progression, and for a time drive the waters in a contrary direction; beside these agitations, the currents act their part in a smaller sphere, being generally greatest where the other motions of the sea art least; namely, nearest the shore; the winds also contribute their share in this universal fluctuation; so that scarcely any part of the sea is wholly seen to stagnate.

> Nil enim quiescit, undis impellitur unda,
> Et spiritus et calor toto se corpore miscent.

As this great element is thus changed, and

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[5] Kircher, Mund. Subt. vol. i. p. 156.

ly labouring internally, it may be readily
that it produces correspondent changes
shores, and those parts of the earth
its influence. In fact, it is every day
onsiderable alterations, either by over-
s shores in one place, or deserting them
; by covering over whole tracts of
hat were cultivated and peopled, at one
by leaving its bed to be appropriated
urposes of vegetation, and to supply a
tre for human industry at another.

struggle between the earth and the sea
ion, the greatest number of our shores
defy the whole rage of the waves, both
height and the rocky materials of which
composed. The coasts of Italy, for in-
re bordered with rocks of marble of dif-
ds, the quarries of which may easily be
hed at a distance from sea, and appear
endicular columns of the most beautiful
marble, ranged along the shore. In
he coasts of France, from Brest to Bour-
e composed of rocks; as are also those
and England, which defend the land, and
interrupted, here and there, to give an
rivers, and to grant the conveniences of
harbours to our shipping. It may in gen-
emarked, that wherever the sea is most
nd furious, there the boldest shores, and
ost compact materials, are found to op-
There are many shores several hundred
endicular, against which the sea, when
with tides or storms, rises and beats
nceivable fury. In the Orkneys,[2] where
s are thus formed, it sometimes, when
by a storm, rises two hundred feet per-
r, and dashes up its spray, together with
other substances that compose its
pon land, like showers of rain.

hence, therefore, we may conceive how
nce of the sea, and the boldness of the
ay be said to have made each other.
e sea meets no obstacles, it spreads its
ith a gentle intumescence, till all its
destroyed, by wanting depth to aid the
But when its progress is checked in
t, by the prominence of rocks, or the
levation of the land, it dashes with all
of its depth against the obstacle, and
its repeated violence, that abruptness of
which confines its impetuosity. Where
is extremely deep, or very much vexed
sts, it is no small obstacle that can con-
rage; and for this reason we see the
shores projected against the deepest
all lesser impediments having long before
mounted and washed away. Perhaps of
hores in the world, there is not one so
hat on the west of St. Kilda, which, upon
measurement,[3] was found to be six hun-
oms perpendicular above the surface of
the sea. Here also, the sea is deep, turbulent, and stormy; so that it requires great force in the shore to oppose its violence. In many parts of the world, and particularly upon the coasts of the East Indies, the shores, though not high above water, are generally very deep, and consequently the waves roll against the land with great weight and irregularity. This rising of the waves against the shore, is called by mariners *the surf of the sea;* and in shipwrecks is generally fatal to such as attempt to swim on shore. In this case no dexterity in the swimmer, no float he can use, neither swimming-girdle nor cork-jacket, will save him; the weight of the superincumbent wave breaks upon him at once, and crushes him with certain ruin. Some few of the natives, however, have the art of swimming and of navigating their little boats near those shores, where an European is sure of instant destruction.

In places where the force of the sea is less violent, or its tides less rapid, the shores are generally seen to descend with a more gradual declivity. Over these, the waters of the tide steal by almost imperceptible degrees, covering them for a large extent, and leaving them bare on its recess. Upon these shores, as was said, the sea seldom beats with any great violence, as a large wave has not depth sufficient to float it onwards, so that here only are to be seen gentle surges making calmly towards land, and lessening as they approach. As the sea, in the former description, is generally seen to present prospects of tumult and uproar, here it more usually exhibits a scene of repose and tranquil beauty. Its waters which, when surveyed from the precipice, afforded a muddy, greenish hue, arising from their depth and position to the eye,[4] when regarded from a shelving shore, wear the colour of the sky, and seem rising to meet it. The deafening noise of the deep sea, is here converted into gentle murmurs; instead of the water's dashing against the face of the rock, it advances and recedes, still going forward, but with just force enough to push its weeds and shells, by insensible approaches, to the shore.

There are other shores, beside those already described, which either have been raised by art, to oppose the sea's approaches, or, from the sea's gaining ground, are threatened with imminent destruction. The sea's being thus seen to give and take away lands at pleasure, is, without question, one of the most extraordinary considerations in all natural history. In some places it is seen to obtain the superiority by slow and certain approaches; or to burst in at once, and overwhelm all things in undistinguished destruction; in other places it departs from its shores, and where its waters have been known to rage, it leaves fields covered with the most beautiful verdure.

The formation of new lands by the sea's con-

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n, vol. ii. p. 199.

[2] Ibid. p. 191.

iption of St. Kilda.

[4] Newton's Optics, pp. 163—167.

tinually bringing its sediment to one place, and by the accumulation of its sands in another, is easily conceived. We have had many instances of this in England.[5] The island of Oxney, which is adjacent to Romney-marsh, was produced in this manner. This had for a long time been a low level, continually in danger of being overflown by the river Rother; but the sea, by its depositions, has gradually raised the bottom of the river, while it has hollowed the mouth: so that the one is sufficiently secured from inundations, and the other is deep enough to admit ships of considerable burthen. The like also may be seen at that bank called the Dogger-sands, where two tides meet, and which thus receives new increase every day, so that in time the place seems to promise fair for being habitable earth. On many parts of the coasts of France, England, Holland, Germany, and Prussia, the sea has been sensibly known to retire.[6] Hubert Thomas asserts, in his description of the Country of Liege, that the sea formerly encompassed the city of Tongres, which, however, is at present thirty-five leagues distant from it: this assertion he supports by many strong reasons; and, among others, by the iron rings fixed in the walls of the town, for fastening the ships that came into the port. In Italy there is a considerable piece of ground gained at the mouth of the river Arno; and Ravenna, that once stood by the sea-side, is now considerably removed from it. But we need scarcely mention these, when we find that the whole republic of Holland seems to be a conquest upon the sea, and in a manner rescued from its bosom. The surface of the earth, in this country, is below the level of the bed of the sea; and I remember, upon approaching the coast, to have looked down upon it from the sea, as into a valley: however, it is every day rising higher by the depositions made upon it by the sea, the Rhine, and the Meuse; and those parts which formerly admitted large men-of-war, are now known to be too shallow to receive ships of very moderate burthen.[7] The province of Jucatan, a peninsula in the gulf of Mexico, was formerly a part of the sea. This tract, which stretches out into the ocean a hundred leagues, and which is above thirty broad, is everywhere, at a moderate depth below the surface, composed of shells, which evince that its land once formed the bed of the sea. In France, the town of Aigues Mortes was a port in the times of St. Louis, which is now removed more than four miles from the sea. Psalmodi, in the same kingdom, was an island in the year 815, but is now more than six miles from the shore. All along the coasts of Norfolk, I am very well assured, that in the memory of man the sea has gained fifty yards in some places, and has lost as much in others.[8]

Thus numerous, therefore, are the instances of new lands having been produced from the sea, which, as we see, is brought about two different ways; first, by the waters raising banks of sand and mud where their sediment is deposited: and, secondly, by their relinquishing the shore entirely, and leaving it unoccupied to the industry of man.

But as the sea has been thus known to recede from some lands, so has it, by fatal experience, been found to encroach upon others; and probably these depredations on one part of the shore, may account for their dereliction from another; for the current which rested upon some certain bank having got an egress in some other place, it no longer presses upon its former bed, but pours all its stream into the new entrance; so that every inundation of the sea may be attended with some correspondent dereliction of another shore.

However this be, we have numerous histories of the sea's inundations, and its burying whole provinces in its bosom. Many countries that have been thus destroyed, bear melancholy witness to the truth of history; and show the tops of their houses and the spires of their steeples, still standing at the bottom of the water. One of the most considerable inundations we have in history, is that which happened in the reign of Henry I., which overflowed the estates of the Earl Godwin, and forms now that bank called the Godwin Sands. In the year 1546, a similar irruption of the sea destroyed a hundred thousand persons in the territory of Dort; and yet a greater number round Dullart. In Friezland and Zealand there were more than three hundred villages overwhelmed; and their ruins continue still visible at the bottom of the water in a clear day. The Baltic sea has, by slow degrees, covered a large part of Pomerania; and, among others, destroyed and overwhelmed the famous port of Vineta. In the same manner, the Norwegian sea has formed several little islands from the mainland, and still daily advances upon the continent. The German sea has advanced upon the shores of Holland, near Catt; so that the ruins

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[5] It is supposed that there existed an isthmus between Great Britain and France, which is conceived to have been broken down by the sea, before the commencement of any accurate historical records respecting these islands.—ED.

[6] Buffon, vol. vi. p. 424.

[7] Ibid.

[8] "An extraordinary gain of land is described to have taken place at the head of the Red sea, the isthmus of Suez having doubled in breadth since the age of Herodotus. In his time, and down to that of Arrian, Heroopolis was on the coast, now it is as far distant from the Red sea as from the Mediterranean. Suez in 1541 received into its harbour the fleet of Solyman II.; but it is now changed into a sand-bank. The country called Tehama, on the Arabian side of the gulf, has increased from three to six miles since the Christian era. Inland from the present ports are the ruins of more ancient towns, which were once on the sea-shore, and bore the same names. It is said that the blown sand from the deserts supplies some part of the materials of this new land, and that the rest is composed of shells and corals, of which the growth is very rapid."—*Lyell's Geology.*

ient citadel of the Romans, which was
uilt upon this coast, are now actually
ter. To these accidents several more
added; our own historians, and those
countries, abound with them; almost
shore of any extent, being able to show
that it has lost, or something that it
from the sea.[9]

re some shores on which the sea has
porary depredations; where it has over-
d after remaining perhaps some ages,
in retired of its own accord, or been
k by the industry of man.[10] There are
ls in Norway, Scotland, and the Maldi-
s, that are at one time covered with
at another free. The country round
f Ely, in the times of Bede, about a
years ago, was one of the most delight-
the whole kingdom; it was not only
ivated, and produced all the necessa-
, but grapes also, that afforded excel-
The accounts of that time are copious
ription of its verdure and fertility; its
res covered with flowers and herbage;
ul shades, and wholesome air. But the
ing in upon the land, overwhelmed the
ntry, took possession of the soil, and
troyed one of the most fertile valleys
ld. Its air, from being dry and health-
hat time became most unwholesome,
d with vapours; and the small part of
y that, by being higher than the rest,
e deluge, was soon rendered uninhabit-
its noxious vapours. Thus this coun-
ued under water for some centuries:
the sea, by the same caprice which
ted its invasions, began to abandon the earth in like manner. It has continued for some ages to relinquish its former conquests; and although the inhabitants can neither boast the longevity nor the luxuries of their former preoccupants, yet they find ample means of subsistence; and if they happen to survive the first years of their residence there, they are often known to arrive at a good old age.

But although history be silent as to many other inundations of the like kind, where the sea has overflowed the country, and afterwards retired, yet we have numberless testimonies of another nature, that prove it beyond the possibility of a doubt: I mean those numerous trees that are found buried at considerable depths in places where either rivers or the sea have accidentally overflown.[11] At the mouth of the river Ness, near Bruges, in Flanders, at the depth of fifty feet, are found great quantities of trees lying as close to each other as they do in a wood; the trunks, the branches, and the leaves, are in such perfect preservation, that the particular kind of each tree may instantly be known. About five hundred years ago, this very ground was known to have been covered by the sea; nor is there any history or tradition of its having been dry ground, which we can have no doubt must have been the case. Thus we see a country flourishing in verdure, producing large forests, and trees of various kinds, overwhelmed by the sea. We see this element depositing its sediment to a height of fifty feet; and its waters must, therefore, have risen much higher. We see the same, after it has thus overwhelmed and sunk the land so deep beneath its slime, capriciously retiring from the same coasts, and leaving that habitable once more, which it had formerly destroyed. All this is wonderful; and, perhaps, instead of attempting to inquire after the cause, which has hitherto been inscrutable, it will best become us to rest satisfied with admiration.

At the city of Modena in Italy, and about four miles round it, wherever it is dug, when the workmen arrive at the depth of sixty-three feet, they come to a bed of chalk, which they bore with an auger five feet deep; they then withdraw from the pit before the auger is removed, and upon its extraction, the water bursts up through the aperture with great violence, and quickly fills this new-made well, which continues full, and is affected neither by rains nor droughts. But that which is most remarkable in this operation, is the layers of earth as we descend. At the depth of fourteen feet are found the ruins of an ancient city, paved streets, houses, floors, and different pieces of Mosaic. Under this is found a solid earth, that would induce one to think had never been removed; however, under it is found a soft oozy earth, made up of vegetables; and at twenty-six feet depth, large trees entire, such as walnut-trees, with the walnuts still sticking on

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straits of Gibraltar are said to become
vider by the wearing down of the cliffs on
many points; and the current sets along
Africa so as to cause considerable inroads
parts, particularly near Carthage. Near
mouth of the Nile, at Aboukir, the coast
devastated in the year 1784, when a small
nearly consumed. By a series of similar
the old sites of the cities of Nicopolis,
Parva, and Canopus, have become a sand-
frequently happens, where the sea is en-
n a coast, that perpendicular cliffs of con-
ight, composed of loose sand, supply, as
le away, large quantities of fine sand,
in mid-air when detached, are carried by
to great distances, covering the land or
the mouths of estuaries. This is exem-
Poole bay, in Hampshire, and in many
e coast of Norfolk and Suffolk. But a
d will sometimes drift the sand of a sea-
carry it up with fragments of shells to
ts, as in the case of the sands of Barry,
ern side of the estuary of the Tay, where
origin attain the height of 140 feet. On
France and Holland long chains of these
been formed in many parts, and often
very important geological changes, by
the mouths of estuaries, and preventing
gress of the tides, or free efflux of river
yell's Geology.
vol. ii. p. 425.

[11] Buffon, vol. ii. p. 403.

the stem, and their leaves and branches in exact preservation. At twenty-eight feet deep, a soft chalk is found, mixed with a vast quantity of shells; and this bed is eleven feet thick. Under this, vegetables are found again, with leaves and branches of trees as before; and thus alternately chalk and vegetable earth to the depth of sixty-three feet. These are the layers wherever the workmen attempt to bore; while in many of them they also find pieces of charcoal, bones, and bits of iron. From this description, therefore, it appears, that this country has been alternately overflowed and deserted by the sea, one age after another: nor were these overflowings and retirings of trifling depth, or of short continuance. When the sea burst in, it must have been a long time in overwhelming the branches of the fallen forest with its sediment; and still longer in forming a regular bed of shells eleven feet over them. It must have, therefore, taken an age at least, to make any one of these layers; and we may conclude, that it must have been many ages employed in the production of them all. The land also, upon being deserted, must have had time to grow compact, to gather fresh fertility, and to be drained of its waters before it could be disposed to vegetation, or before its trees could have shot forth again to maturity.

We have instances nearer home of the same kind given us in the Philosophical Transactions; one of them by Mr. Derham. An inundation of the sea, at Dagenham, in Essex, laying bare a part of the adjacent pasture for above two hundred feet wide, and, in some places, twenty deep, it discovered a number of trees that had lain there for many ages before: these trees, by lying long under ground, were become black and hard, and their fibres so tough, that one might as easily break a wire as any of them; they lay so thick in the place where they were found, that in many parts he could step from one to another: he conceived also, that not only all the adjacent marshes, for several hundred acres, were covered underneath with such timber, but also the marshes along the mouth of the Thames, for several miles. The meeting with these trees at such depths, he ascribes to the sediment of the river, and the tides, which constantly washing over them, have always left some part of their substance behind, so as, by repeated alluvions, to work a bed of vegetable earth over them, to the height at which he found it.

The levels of Hatfield-Chace, in Yorkshire, a tract of above eighteen thousand acres, which was yearly overflown, was reduced to arable and pasture-land, by one Sir Cornelius Vermusden, a Dutchman. At the bottom of this wide extent, are found millions of the roots and bodies of trees, of such as this island either formerly did, or does at present, produce. The roots of all stand in their proper postures; and by them, as thick as ever they could grow, the respective trunks of each, some above thirty yards long. The oaks, some of which have been sold for fifteen pounds a-piece, are as black as ebony, very lasting, and close-grained. The ash-trees are as soft as earth, and are commonly cut in pieces by the workmen's spades, and as soon as flung up into the open air turn into dust. But all the rest, even the willows themselves, which are softer than the ash, preserve their substance and texture to this very day. Some of the firs appear to have vegetated, even after they were fallen, and to have, from their branches, struck up large trees, as great as the parent trunk. It is observable, that many of these trees have been burnt, some quite through, some on one side, some have been found chopped and squared, others riven with great wooden wedges; all sufficiently manifesting, that the country which was deluged had formerly been inhabited. Near a great root of one tree, were found eight coins of the Roman emperors; and, in some places the marks of the ridge and furrow were plainly perceivable, which testified that the ground had formerly been patient of cultivation.

The learned naturalist who has given this description,[12] has pretty plainly evinced, that this forest in particular must have been thus levelled by the Romans; and that the falling of the trees must have contributed to the accumulation of the waters. "The Romans," says he, "when the Britons fled, always pursued them into the fortresses of low woods, and miry forests: in these the wild natives found shelter; and, when opportunity offered, issued out and fell upon their invaders without mercy. In this manner the Romans were at length so harassed, that orders were issued out for cutting down all the woods and forests in Britain. In order to effect this, and destroy the enemy the easier, they set fire to the woods, composed of pines and other inflammable timber, which spreading, the conflagration destroyed not only the forest, but infinite numbers of the wretched inhabitants who had taken shelter therein. When the pine-trees had thus done what mischief they could, the Romans then brought their army nearer, and, with whole legions of the captive Britons, cut down most of the trees that were yet left standing; leaving only here and there, some great trees untouched, as monuments of their fury. These, unneedful of their labour, being destitute of the support of the underwood, and of their neighbouring trees, were easily overthrown by the winds, and, without interruption, remained on the places where they happened to fall. The forest, thus fallen, must necessarily have stopped up the currents, both from land and sea; and turned into great lakes, what were before but temporary streams. The working of the waters here, the consumption and decay of rotten boughs and branches, and the vast increase of water-moss which flourishes upon marshy grounds, soon formed a covering over the trunks of the fallen trees, and raised the earth several feet above its former level. The earth thus every day swelling, by a continual increase from the sediment of the waters, and by the lightness of the vegetable substances of which it was composed, soon overtopt the waters by which this intumescence was at first effected; so that it entirely got rid of its inundations, or only demanded a slight assistance from man for that purpose." This may be the origin of all bogs, which are formed by the putrefaction of vegetable substances, mixed with the mud and slime deposited by waters, and at length acquiring a sufficient consistency.

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[12] Phil. Trans. vol. iv part ii. p. 214.

From this we see what powerful effects the sea is capable of producing upon its shores, either by overflowing some, or deserting others; by altering the direction of these, and rendering those craggy and precipitate, which before were shelving. But the influence it has upon these is nothing to that which it has upon that great body of earth which forms its bottom. It is at the bottom of the sea that the greatest wonders are performed, and the most rapid changes are produced; it is there that the motions of the tides and the currents have their whole force, and agitate the substances of which their bed is composed. But all these are almost wholly hid from human curiosity: the miracles of the deep are performed in secret; and we have but little information from its abysses, except what we receive by inspection at very shallow depths, or by the plummet, or from divers, who are known to descend from twenty to thirty fathoms.[13]

The eye can reach but a very short way into the depths of the sea; and that only when its surface is glassy and serene. In many seas it perceives nothing but a bright sandy plain at bottom, extending for several hundred miles, without an intervening object. But in others, particularly in the Red sea, it is very different: the whole bottom of this extensive bed of waters is, literally speaking, a forest of submarine plants, and corals formed by insects for their habitation, sometimes branching out to a great extent. Here are seen the madrepores, the sponges, mosses, sea-mushrooms, and other marine productions, covering every part of the bottom; so that some have even supposed the sea to have taken its name from the colour of its plants below. However, these plants are by no means peculiar to this sea, as they are found in great quantities in the Persian gulf, along the coasts of Africa, and those of Provence and Catalonia.

The bottom of many parts of the sea near America presents a very different, though a very beautiful appearance. This is covered with vegetables, which make it look as green as a meadow, and beneath are seen thousands of turtles, and other sea-animals, feeding thereon.

In order to extend our knowledge of the sea to greater depths, recourse has been had to the plummet; which is generally made of a lump of lead of about forty pounds weight, fastened to a cord.[14] This, however, only answers in moderate depths; for when a deep sea is to be sounded, the matter of which the cord is composed, being lighter than the water, floats upon it, and when let down to a considerable depth, its length so increases its surface, that it is often sufficient to prevent the lead from sinking; so that this may be the reason why some parts of the sea are said to have no bottom.[15]

In general, we learn from the plummet, that the bottom of the sea is tolerably even where it has been examined; and that the farther from the shore, the sea is in general the deeper. Notwithstanding, in the midst of a great and unfathomable ocean, we often find an island raising its head, and singly braving its fury. Such islands may be considered as the mountains of the deep; and, could we for a moment imagine the waters of the ocean removed or dried away, we should probably find the inequalities of its bed resembling those that are found at land. Here extensive plains, there valleys, and, in many places, mountains of amazing height. M. Buache has actually given us a map of that part of its bottom which lies between Africa and America, taken from the several soundings of mariners: in it we find the same uneven surface that we do upon land, the same eminences, and the same depressions. In such an imaginary prospect, however, there would be this difference, that as the tops of land-mountains appear the most barren and rocky, the tops of sea-mountains would be found the most verdant and fruitful.

The plummet, which thus gives us some idea of the inequalities of the bottom, leaves us totally in the dark as to every other particular; recourse, therefore, has been had to divers: these, either being bred up in this dangerous way of life, and accustomed to remain some time under water without breathing, or assisted by means of a diving-bell, have been able to return some confused and uncertain accounts of the places below. In the great diving-bell improved by Dr. Halley, which was large enough to contain five men, and was supplied with fresh air by buckets, that alternately rose and fell, they descended fifty fathoms. In this huge machine, which was let down from the mast of the ship, the doctor himself went down to the bottom, where, when the sea was clear, and especially when the sun shone, he could see perfectly well to write or read, and much more to take up any thing underneath: at other times, when the water was troubled and thick, it was dark as night below, so that he was obliged to keep a candle lighted at the bottom. But there is one thing very remarkable, that the water which from above was usually seen of a green colour, when looked at from below, appeared to him of a very different one, casting a redness upon one of his hands, like that of damask roses:[16]—a proof of the sea's taking its colour not from any thing floating in it, but from the different reflections of the rays of light. Upon the whole, the accounts we have received from the bottom, by this contrivance, are but few. We learn from it, and from divers in general, that while the surface of the sea may be deformed by tempests, it is usually calm and temperate below;[17] that some divers, who have gone down when the weather was calm, and came up when it was tempestuous, were surprised at their not perceiving the change at the bottom. This, however, must not be supposed to obtain with regard to the tides, and the currents, as they are seen constantly shifting their bottom; taking their bed with great violence from one place, and depositing it upon another. We are informed, also, by divers, that the sea grows colder in proportion as they descend to the bottom; that as far as the sun's rays pierce, it is influenced by their warmth; but lower, the cold becomes almost intolerable. A person of quality, who had been himself a diver, as Mr. Boyle informs us, declared, that though he seldom descended above three or four fathoms, yet he found it so much colder than near the top, that he could not well endure it; and that being let down in a great diving-bell, although the water could not immediately touch him, he found the air extremely cold upon his first arrival at the bottom.

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[13] Phil. Trans. vol. iv. part ii. p. 192.

[14] Buffon, vol. ii. p. 5.

[15] The sea was recently sounded by lead and line in latitude 57° south, and 85° 7' west from Paris, by the officers of the French ship Venus, during a voyage of discovery. At a depth of 3,470 yards, or nearly two miles, no bottom was found; the weather was very serene, yet it is said that hauling in the lead took 60 sailors upwards of two hours. In another place in the Pacific ocean no bottom was found at the depth of 4,140 yards.—ED.

From divers also we learn that the sea, in many places, is filled with rocks at bottom; and that among their clefts, and upon their sides, various substances sprout forward, which are either really vegetables, or the nests of insects, increased to some magnitude. Some of these assume the shape of beautiful flowers; and, though soft when taken up, soon harden, and are kept in the cabinets of the curious.

But of all those divers who have brought us information from the bottom of the deep, the famous Nicola Pesce, whose performances are told us by Kircher, is the most celebrated. I will not so much as pretend to vouch for the veracity of Kircher's account, which he assures us he had from the archives of the kings of Sicily; but it may serve to enliven a heavy chapter. "In the times of Frederic, king of Sicily, there lived a celebrated diver, whose name was Nicholas, and who, from his amazing skill in swimming, and his perseverance under water, was surnamed the *Fish*. This man had from his infancy been used to the sea; and earned his scanty subsistence by diving for corals and oysters; which he sold to the villagers on shore. His long acquaintance with the sea, at last brought it to be almost his natural element. He frequently was known to spend five days in the midst of the waves, without any other provisions than the fish which he caught there, and ate raw. He often swam over from Sicily to Calabria, a tempestuous and dangerous passage, carrying letters from the king. He was frequently known to swim among the gulfs of the Lipari islands, no way apprehensive of danger.

"Some mariners out at sea, one day observed something at some distance from them which they regarded as a sea-monster: but, upon its approach, it was known to be Nicholas, whom they took into their ship. When they asked him whither he was going in so stormy and rough a sea, and at such a distance from land, he showed them a packet of letters, which he was carrying to one of the towns of Italy exactly done up in a leather bag, in such a manner as that they could not be wetted by the sea. He kept them thus company for some time on their voyage, conversing and asking questions; and after eating a hearty meal with them, he took his leave, and jumping into the sea, pursued his voyage alone.

"In order to aid these powers of enduring in the deep, nature seemed to have assisted him in a very extraordinary manner; for the spaces between his fingers and toes were webbed as in a goose; and his chest became so very capacious, that he could take in at one inspiration, as much breath as would serve him for a whole day.

"The account of so extraordinary a person did not fail to reach the king himself, who, actuated by the general curiosity, ordered that Nicholas should be brought before him. It was no easy matter to find Nicholas, who generally spent his time in the solitudes of the deep; but at last, however, after much searching, he was found, and brought before his majesty. The curiosity of this monarch had been long excited by the accounts he had heard of the bottom of the gulf of Charybdis; he therefore conceived that it would be a proper opportunity to have more certain information; and commanded our poor diver to examine the bottom of this dreadful whirlpool: as an incitement to his obedience, he ordered a golden cup to be flung into it. Nicholas was not insensible of the danger to which he was exposed: dangers best known only to himself; and he therefore presumed to remonstrate; but the hopes of the reward, the desire of pleasing the king, and the pleasure of showing his skill, at last prevailed. He instantly jumped into the gulf, and was swallowed as instantly up in its bosom. He continued for three quarters of an hour below; during which time the king and his attendants remained upon shore anxious for his fate; but he at last appeared, buffeting upon the surface, holding the cup in triumph in one hand, and making his way good among the waves with the other. It may be supposed he was received with applause, upon his arrival on shore; the cup was made the reward of his adventure; the king ordered him to be taken proper care of; and, as he was somewhat fatigued and debilitated by his labour, after a hearty meal he was put to bed, and permitted to refresh himself by sleeping.

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[16] Newton's Optics, p. 56.

[17] Boyle, vol. iii. p. 242.

"When his spirits were thus restored, he was again brought to satisfy the king's curiosity with a narrative of the wonders he had seen; and his account was to the following effect:—He would never, he said, have obeyed the king's commands, had he been apprized of half the dangers that were before him. There were four things, he said, that rendered the gulf dreadful, not only to men, but even to the fishes themselves: first, the force of the water bursting up from the bottom, which requires great strength to resist; secondly, the abruptness of the rocks, that on every side threatened destruction; thirdly, the force of the whirlpool, dashing against those rocks; and fourthly, the number and magnitude of the polypus fish, some of which appeared as large as a man, and which everywhere sticking against the rocks, projected their fibrous arms to entangle him. Being asked how he was able so readily to find the cup that had been thrown in, he replied that it happened to be flung by the waves into the cavity of a rock, against which he himself was urged in his descent. This account, however, did not satisfy the king's curiosity: being requested to venture once more into the gulf for further discoveries, he at first refused; but the king, desirous of having the most exact information possible of all things to be found in the gulf, repeated his solicitations; and to give them still greater weight, produced a larger cup than the former, and added also a purse of gold. Upon these considerations, the unfortunate Pessacola once again plunged into the whirlpool, and was never heard of more."

CHAP. XVIII.

A SUMMARY ACCOUNT OF THE MECHANICAL PROPERTIES OF AIR.

HAVING described the earth and the sea, we now ascend into that fluid which surrounds them both; and which, in some measure, supports and supplies all animated nature. As upon viewing the bottom of the ocean from its surface, we see an infinity of animals moving therein, and seeking food; so, were some superior being to regard the earth at a proper distance, he might consider us in the same light; he might from his superior station behold a number of busy little beings, immersed in the aerial fluid that everywhere surrounds them, and sedulously employed in procuring the means of subsistence. This fluid, though too fine for the gross perception of its inhabitants, might to his nicer organs of sight be very visible; and while he at once saw into its operations, he might smile at the varieties of human conjecture concerning it; he might readily discern, perhaps, the height above the surface of the earth to which this fluid atmosphere reaches; he might exactly determine the peculiar form of its parts which gives it the spring or elasticity with which it is endued: he might distinguish which of its parts were pure incorruptible air, and which only made for a little time to assume the appearance, so as to be quickly returned back to the element from whence it came. But as for us, who are immersed at the bottom of this gulf, we must be contented with a more confined knowledge; and, wanting a proper point of prospect, remain satisfied with a combination of the effects.

One of the first things that our senses inform us of, is, that although the air is too fine for our sight, it is very obvious to our touch. Although we cannot see the wind contained in a bladder, we can very readily feel its resistance; and though the hurricane may want colour, we often fatally experience that it does not want force. We have equal experience of the air's spring or elasticity; the bladder when pressed, returns again, upon the pressure being taken away; a bottle, when filled, often bursts from the spring of air which is included.

So far the slightest experience reaches; but, by carrying experiment a little further, we learn, that air also is heavy: a round glass vessel being emptied of its air, and accurately weighed, has been found lighter than when it was weighed with the air in it. Upon computing the superior weight of the full vessel, a cubic foot of air is found to weigh something more than an ounce.

From this experiment, therefore, we learn, that the earth, and all things upon its surface, are everywhere covered with a ponderous fluid, which rising very high over our heads, must be proportionably heavy. For instance, as in the sea, a man at the depth of twenty feet sustains a greater weight of water, than a man at the depth of but ten feet; so will a man at the bottom of a valley have a greater weight of air over him, than a man on the top of a mountain.

From hence we may conclude, that we sustain a very great weight of air; and although, like men walking at the bottom of the sea, we cannot feel the weight which presses equally round us, yet the pressure is not the less real. As in morals we seldom know the blessings that surround us, till we are deprived of them; so here we do not perceive the weight of the ambient fluid till a part of it is taken away. If, by any means, we contrive to take away the pressure of the air from any one part of our bodies, we are soon made sensible of the weight upon the other parts.

Thus, if we clap our hand upon the mouth of a vessel from whence the air has been taken away, there will thus be air on one side and none on the other; upon which we shall instantly find the hand violently sucked inwards; which is nothing more than the weight of the air upon the back of the hand that forces it into the space which is empty below.

As, by this experiment, we perceive that the air presses with great weight upon every thing on the surface of the earth, so by other experiments we learn the exact weight with which it presses. First, if the air be exhausted out of any vessel, a drinking vessel, for instance,[1] and this vessel be set with the mouth downwards in water, the water will rise up into the empty space, and fill the inverted glass; for the external air will, in this case, press up the water where there is no weight to resist; as, one part of a bed being pressed, makes the other parts that have no weight upon them, rise. In this case, as was said, the water being pressed without, will rise in the glass; and would continue to rise (if the empty glass were tall enough) thirty-two feet high. In fact, there have been pipes made purposely for this experiment, of above thirty-two feet high, in which, upon being exhausted, the water has always risen to the height of thirty-two feet; there it has always rested, and never ascended higher. From this, therefore, we learn, that the weight of the air which presses up the water, is equal to a pillar or column of water which is thirty-two feet high; as it is just able to raise such a column and no more. In other words, the surface of the earth is everywhere covered with a weight of air, which is equivalent to a covering of thirty-two feet deep of water; or to a weight of twenty-nine inches and a-half of quicksilver, which is known to be just as heavy as the former.

Thus we see that the air, at the surface of the earth, is just as heavy as thirty-two feet of water, or twenty-nine inches and a-half of quicksilver; and it is easily found by computation, that to raise water thirty-two feet, will require a weight of fifteen pounds upon every square inch. Now, if we are fond of computations, we have only to calculate how many square inches are in the surface of an ordinary human body, and allowing every inch to sustain fifteen pounds, we may amaze ourselves at the weight of air we sustain. It has been computed, and found, that our ordinary load of air amounts to within a little of forty thousand pounds: this is wonderful; but wondering is not the way to grow wise.

Notwithstanding this be our ordinary load, and our usual supply, there are, at different times, very great variations. The air is not, like water, equally heavy at all seasons; but sometimes is lighter, and sometimes more heavy. It is sometimes more compressed, and sometimes more elastic or springy, which produces the same effects as an increase of its weight. The air, which at one time raises water thirty-two feet in the tube, and quicksilver twenty-nine inches, will not at another raise the one to thirty feet, or the other to twenty-six inches. This makes, therefore, a very great difference in the weight we sustain; and we are actually known, by computation, to carry at one time four thousand pounds of air more than at another.

The reason of this surprising difference in the weight of air, is either owing to its pressure from above, or to an increase of vapour floating in it. Its increased pressure is the consequence of its spring or elasticity, which cold and heat sensibly affect, and are continually changing.[2]

This elasticity of the air is one of its most amazing properties; and to which it should seem nothing can set bounds. A body of air that may be contained in a nut shell, may easily, with heat, be dilated into a sphere of unknown dimensions. On the contrary, the air contained in a house, may be compressed into a cavity not larger than the eye of a needle. In short, no bounds can be set to its confinement or expansion; at least, experiment has hitherto found its attempts indefinite. In every situation, it retains its elasticity; and the more closely we compress it, the more strongly does it resist the pressure. If to the increasing the elasticity on one side by compression, we increase it on the other side by heat, the force of both soon becomes irresistible; and a certain French philosopher[3] supposed that air thus confined and expanding, was sufficient for the explosion of a world.

Many instruments have been formed to measure and determine these different properties of the air; and which serve several useful purposes. The barometer serves to measure its weight; to tell us when it is heavier, and when lighter. It is composed of a glass tube or pipe, of about thirty inches in length, closed up at one end: this tube is then filled with quicksilver; this done, the maker clapping his finger upon the open end, inverts the tube, and plunges the open end, finger and all, into a basin of quicksilver, and then takes his finger away; now the quicksilver in the tube will, by its own weight, endeavour to descend into that within the basin; but the external air, pressing on the surface of the quicksilver in the basin without, and no air being in the tube at top, the quicksilver will continue in the tube, being pressed up, as was said, by the air, on the surface of the basin below. The height at which it is known to stand in the tube, is usually about twenty-nine inches when the air is heavy; but not above twenty-six when the air is very light. Thus, by this instrument, we can with some exactness determine the weight of the air; and, of consequence, tell beforehand the changes of the weather. Before fine dry weather, the air is charged with a variety of vapours, which float in it unseen, and render it extremely heavy, so that it presses up the quicksilver; or, in other words, the barometer rises. In moist, rainy weather, the vapours are washed down, or there is not heat sufficient for them to rise, so that the air is then sensibly lighter, and presses up the quicksilver with less force; or, in other words, the barometer is seen to fall.[4] Our constitutions seem also to correspond with the changes of the weather-glass; they are braced, strong, and vigorous, with a large body of air upon them; they are languid, relaxed, and feeble when the air is light, and refuses to give our fibres their proper tone.

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[1] This may be done by burning a bit of paper in the same, and then quickly turning it down upon the water.

[2] If the atmosphere were of uniform density, it would be easy to ascertain with the utmost accuracy, the height to which it extends: for the height of the atmosphere would obviously be to the height of the mercury in the barometer, as the specific gravity of common air is to the specific gravity of mercury. By making the calculation on this supposition, it will be found that the height of the atmosphere is a little more than 5 miles. As the air, however, gradually diminishes in density, the atmosphere must reach to a much greater distance from the earth than 5 miles. It appears from the duration of twilight, that at the height of 44½ miles, the atmosphere is sufficiently dense to intercept the light of the sun, and reflect it to the earth. We are therefore entitled to conclude that it extends to a much greater height. —ED.

[3] Monsieur Amontons.

But although the barometer thus measures the weight of the air with exactness enough for the general purposes of life, yet it is often affected with a thousand irregularities that no exactness in the instrument can remedy, nor no theory account for. When high winds blow, the quicksilver generally is low: it rises higher in cold weather than in warm; and is usually higher at morning and evening than at mid-day: it generally descends lower after rain than it was before it. There are also frequent changes in the air, without any sensible alteration in the barometer.[5]

As the barometer is thus used in predicting the changes of the weather, so is it also serviceable in measuring the heights of mountains, which mathematicians cannot so readily do: for, as the higher we ascend from the surface of the earth the air becomes lighter, so the quicksilver in the barometer will descend in proportion. It is found to sink at the rate of the tenth part of an inch for every ninety feet we ascend; so that in going up a mountain, if I find the quicksilver fallen an inch, I conclude that I am got upon an ascent of near nine hundred feet high. In this there has been found some variation; into a detail of which it is not the business of a natural historian to enter.

In order to determine the elasticity of air, the wind-gun has been invented, which is an instrument variously made; but in all upon the principle of compressing a large quantity of air into a tube, in which there is an ivory ball, and then giving the compressed elastic air free power to act, and drive the ball as directed. The ball, thus driven, will pierce a thick board; and will be as fatal, at small distances, as if driven with gunpowder. I do not know whether ever the force of this instrument has been assisted by means of heat; certain I am, that this, which could be very easily contrived by means of phosphorus, or any other hot substance applied to the barrel, would give such a force as I doubt whether gunpowder itself could produce.

The air-pump is an instrument contrived to exhaust the air from round a vessel adapted to that purpose, called a receiver. This method of exhausting, is contrived in the simple instrument by a piston, like that of a syringe, going down into the vessel, and thus pushing out its air; which, by means of a valve, is prevented from returning into the vessel again. But this, like all other complicated instruments, will be better understood by a minute inspection, than an hour's description: it may suffice here to observe, that by depriving animals, and other substances, of all air, it shows us what the benefits and effects of air are in sustaining life, or promoting vegetation.

The digester is an instrument of still more ex-

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[4] Professor Leslie has proposed a theory of the depression of the barometer, in which he supposes that the wind, describing a curve in passing over the surface of the globe, acquires a centrifugal force sufficient to diminish the pressure of the air on the earth's surface, and consequently to depress the barometer. Mr. Daniell, in his 'Meteorological Essays,' endeavours to controvert this theory. A writer in 'Jamieson's Edinburgh Journal' remarks, that the curvilinear motion of the wind, describing a circle about the earth, in place of always lowering the barometer, ought frequently to augment the pressure of the atmosphere, because when the wind is from the east, the diurnal motion round the earth's axis is lessened, and its centrifugal force weakened; and so the air will be at more liberty to gravitate or press freely on the earth's surface, and consequently to raise the barometer. Westerly winds, on the contrary, by crossing with the diurnal motion, increase the centrifugal force and diminish the pressure. Hence the reason why the barometer is commonly lower with westerly winds than easterly.—ED.

[5] The variations of the barometer between the tropics are very trifling, and it is worthy of observation, it does not descend more than half as much in that part of the globe, for every 200 feet of elevation, as it does beyond the tropics; besides, the barometer rises about two-thirds of a line twice during each day in the torrid zone. The range of the barometer increases gradually as the latitude advances towards the poles, till it amounts to two or three inches.—The following table will explain the gradual increase alluded to: it is compiled from the best authorities.

		RANGE OF THE BAROMETER.	
Latitude.	*Places.*	*Greatest.*	*Annual.*
0° 0′	Peru,	0.20	——
22° 23′	Calcutta,	0.77	——
33° 55′	Cape Town,	——	0.89
40° 55′	Naples,	1.00	——
51° 8′	Dover,	2.47	1.80
53° 13′	Middlewick,	3.00	1.94
53° 23′	Liverpool,	2.89	1.96
59° 56′	Petersburg,	3.45	2.77

ED.

traordinary effects than any of the former; and sufficiently discovers the amazing force of air, when its elasticity is augmented by fire. A common tea-kettle, if the spout were closed up, and the lid put firmly down, would serve to become a digester, if strong enough. But the instrument used for this purpose, is a strong metal pot, with a lid to screw close on, so that, when down, no air can get in or return: into this pot meat and bones are put, with a small quantity of water, and then the lid screwed close: a lighted lamp is put underneath, and, what is very extraordinary (yet equally true), in six or eight minutes the whole mass, bones and all, are dissolved into a jelly; so great is the force and elasticity of the air contained within, struggling to escape, and breaking in pieces all the substances with which it is mixed. Care, however, must be taken not to heat this instrument too violently; for then, the enclosed air would become irresistible, and burst the whole, with perhaps a fatal explosion.

There are numberless other useful instruments made to depend on the weight, the elasticity, or the fluidity of the air, which do not come within the plan of the present work; the design of which is not to give an account of the inventions that have been made for determining the nature and properties of air, but a mere narrative of its effects. The description of the pump, the forcing-pump, the fire-engine, the steam-engine, the syphon, and many others, belong not to the naturalist, but the experimental philosopher: the one gives a history of Nature, as he finds she presents herself to him; and he draws the obvious picture: the other pursues her with close investigation, tortures her by experiment to give up her secrets, and measures her latent qualities with laborious precision. Much more, therefore, might be said of the mechanical effects of air, and of the conjectures that have been made respecting the form of its parts; how some have supposed them to resemble little hoops, coiled up in a spring; others, like fleeces of wool; others, that the parts are endued with a repulsive quality, by which, when squeezed together, they endeavour to fly off, and recede from each other. We might have given the disputes relative to the height to which this body of air extends above us, and concerning which there is no agreement. We might have inquired how much of the air we breathe is elementary, and not reducible to any other substance; and of what density it would become, if it were supposed to be continued down to the centre of the earth. At that place we might, with the help of figures, and a bold imagination, have shown it twenty thousand times heavier than its bulk of gold. We might also prove it millions of times purer than upon earth, when raised to the surface of the atmosphere. But these speculations do not belong to natural history; and they have hitherto produced no great advantages in that branch of science to which they more properly appertain.[6]

CHAP. XIX.

AN ESSAY TOWARD A NATURAL HISTORY OF THE AIR.

A late eminent philosopher has considered our atmosphere as one large chemical vessel, in which an infinite number of various operations are constantly performing. In it all the bodies of the earth are continually sending up a part of their substance by evaporation, to mix in this great alembic, and to float a while in common. Here minerals, from their lowest depths, ascend in noxious, or in warm vapours, to make a part of the general mass; seas, rivers, and subterraneous springs, furnish their copious supplies; plants receive and return their share; and animals that, by living upon, consume this general store, are found to give it back in greater quantities when they die.[1] The air, therefore, that we breathe, and upon which we subsist, bears very little resemblance to that pure elementary body which was described in the last chapter; and which is rather a substance that may be conceived, than experienced to exist. Air, such as we find it, is one of the most compounded bodies in all nature.[2] Water may be reduced to a fluid every way resembling air, by heat; which, by cold, becomes water again. Every thing we see gives off its parts to the air, and has a little floating atmosphere of its own round it. The rose is encompassed with a sphere of its own odorous particles; while the night-shade infects the air with scents of a more ungrateful nature. The perfume of musk flies off in such abundance, that the quantity remaining becomes sensibly lighter by the loss. A thousand substances that escape all our senses, we know to be there; the powerful emanations of the loadstone, the effluvia of electricity, the rays of light, and the insinuations of fire. Such are the various substances through which we move, and which we are constantly taking in at every pore, and returning again with imperceptible discharge!

This great solution, or mixture of all earthly bodies, is continually operating upon itself; which, perhaps, may be the cause of its unceasing motion; but it operates still more visibly upon such grosser substances as are exposed to its influence; for scarce any substance is found capable of resisting the corroding qualities of the air. The air, say the chemists, is a chaos, furnished with all kinds of salts and menstruums; and, therefore, it is capable of dissolving all kinds of bodies. It is well known, that copper and iron are quickly covered, and eaten with rust; and that in the climates near the equator, no art can keep them clean. In those dreary countries, the instruments, knives and keys, that are kept in the pocket, are nevertheless quickly incrusted; and the great guns, with every precaution, after some years, become useless. Stones, as being less hard, may be readily supposed to be more easily soluble. The marble of which the noble monuments of Italian antiquity are composed, although in one of the finest climates in the world, show the impressions which have been made upon them by the air. In many places they seem worm-eaten by time; and, in others, they appear crumbling into dust. Gold alone seems to be exempted from this general state of dissolution; it is never found to contract rust, though exposed never so long: the reason of this seems to be, that sea-salt, which is the only menstruum capable of acting upon, and dissolving gold, is but very little mixed with the air; for salt being a very fixed body, and not apt to volatilize, and rise with heat, there is but a small proportion of it in the atmosphere. In the elaboratories and shops, however, where salt is much used, and the air is impregnated with it, gold is found to rust as well as other metals.

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[6] See Supplementary Note A to next chapter.

[1] Boyle, vol. ii. p. 593.

[2] See Supplementary Note A, p. 156.

Bodies of a softer nature are obviously destroyed by the air.[3] Mr. Boyle says, that silks brought to Jamaica, will, if there exposed to the air, rot even while they preserve their colour; but if kept therefrom, they both retain their strength and gloss. The same happens in Brazil, where their clothes, which are black, soon turn of an iron colour; though in the shops, they preserve their proper hue.[4] In these tropical climates also, such are the putrescent qualities of the air, that white sugar will sometimes be full of maggots. Drugs and plasters lose their virtue, and become verminous. In some places they are obliged to expose their sweetmeats by day in the sun, otherwise the night-air would quickly cause them to putrefy. On the contrary, in the cold arctic regions, animal substances, during the winter are never known to putrefy; and meat may be kept for months without any salt whatsoever. This experiment happily succeeded with the eight Englishmen that were accidentally left upon the inhospitable coasts of Greenland, at a place where seven Dutchmen had perished but a few years before; for killing some rein-deer for their subsistence, and having no salt to preserve the flesh, to their great surprise they soon found it did not want any, as it remained sweet during their eight months' continuance upon that shore.

These powers with which air is endued over unorganized substances, are exerted in a still stronger manner over plants, animals of an inferior nature, and lastly, over man himself. Most of the beauty and the luxuriance of vegetation, is well known to be derived from the benign influence of the air; and every plant seems to have its favourite climate, not less than its proper soil. The lower ranks of animals also seem formed for their respective climates, in which only they can live. Man alone seems the child of every climate, and capable of existing in all. However, this peculiar privilege does not exempt him from the influences of the air; he is as much subject to its malignity as the meanest insect or vegetable.

With regard to plants, air is so absolutely necessary for their life and preservation, that they will not vegetate in an exhausted receiver. All plants have within them a quantity of air, which supports and agitates their juices. They are continually imbibing fresh nutriment from the air, to increase this store, and to supply the wants which they sustain from evaporation. When, therefore, the external air is drawn from them, they are no longer able to subsist. Even that quantity of air which they before were possessed of, escapes through their pores, into the exhausted receiver; and as this continues to be pumped away, they become languid, grow flaccid, and die. However, the plant or flower thus ceasing to vegetate, is kept, by being secured from the external air, a much longer time sweet than it would have continued had it been openly exposed.

That air which is so necessary to the life of vegetables, is still more so to that of animals; there are none found, how seemingly torpid soever, that do not require their needful supply. Fishes themselves will not live in water from whence the air is exhausted; and it is generally supposed that they die in frozen ponds, from the want of this necessary to animal existence. Many have been the animals that idle curiosity has tortured in the prison of a receiver, merely to observe the manner of their dying. We shall, from a thousand instances, produce that of the viper, as it is known to be one of the most vivacious reptiles in the world; and as we shall feel but little compassion for its tortures. Mr. Boyle took a new-caught viper, and shutting it up into a small receiver, began to pump away the air.[5] "At first, upon the air's being drawn away, it began to swell; some time after he had done pumping, it began to gape, and open its jaws; being thus compelled to open its jaws, it once more resumed its former lankness; it then began to move up and down within, as if to seek for air, and after a while foamed a little, leaving the foam sticking to the inside of the glass; soon after, the body and neck grew prodigiously tumid, and a blister appeared upon its back; an hour and a-half after the receiver was exhausted, the distended viper moved, and gave manifest signs of life; the jaws remained quite distended; as it were from beneath the epiglottis, came the black tongue, and reached beyond it; but the animal seemed, by its posture, not to have any life; the mouth also was grown blackish within; and in this situation it continued for twenty-three hours. But upon the air being re-admitted, the viper's mouth was presently closed, and soon after opened again; and for some time those motions continued, which argued the remains of life." Such is the fate of the most insignificant or minute reptile that can be thus included. Mites, fleas, and even the little eels that are found swimming in vinegar, die for want of air. Not only these, but the eggs of these animals will not produce in vacuo, but require air to bring them to perfection.

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[3] Buffon, vol. iii. p. 62.

[4] Ibid. vol. iii. p. 68.

[5] Boyle's Physico-Mechan. Exper. *passim*.

As in this manner air is necessary to their subsistence, so also it must be of a proper kind, and not impregnated with foreign mixtures. That factitious air which is pumped from plants or fluids, is generally, in a short time, fatal to them. Mr. Boyle has given us many experiments to this purpose. After having shown that all vegetable and most mineral substances, properly prepared, may afford air, by being placed in an exhausted receiver, and this in such quantities, that some have thought it a new substance made by the alteration which the mineral or plant has undergone by the texture of its parts being loosened in the operation—having shown, I say, that this air may be drawn in great quantities from vegetable, animal, or mineral substances, such as apples, cherries, amber burned, or hartshorn[6]—he included a frog in artificial air, produced from paste; in seven minutes' space it suffered convulsions, and at last lay still, and being taken out, recovered no motion at all, but was dead. A bird enclosed in artificial air, from raisins, died in a quarter of a minute, and never stirred more. A snail was put into the receiver, with air of paste; in four minutes it ceased to move, and was dead, although it had survived in vacuo for several hours: so that factitious air proved a greater enemy to animals than even a vacuum itself.

Air also may be impregnated with fumes that are instantly fatal to animals. The fumes of hot iron, copper, or any other heated metal, blown into the place where an animal is confined, instantly destroy it. We have already mentioned the vapours in the grotto Del Cane suffocating a dog. The ancients even supposed, that these animals, as they always ran with their noses to the ground, were the first that felt any infection. In short, it should seem that the predominance of any one vapour, from any body, how wholesome soever in itself, becomes infectious; and that we owe the salubrity of the air to the variety of its mixture.

But there is no animal whose frame is more sensibly affected by the changes of the air than man. It is true, he can endure a greater variety of climates than the lower orders generally are able to do; but it is rather by the means which he has discovered of obviating their effects, than by the apparent strength of his constitution. Most other animals can bear cold or hunger better, endure greater fatigues in proportion, and are satisfied with shorter repose. The variations of the climate, therefore, would probably affect them less, if they had the same means or skill in providing against the severities of the change. However this be, the body of man is an instrument much more nicely sensible of the variations of the air, than any of those which his own art has produced; for his frame alone seems to unite all their properties, being invigorated by the weight of the air, relaxed by its moisture, enfeebled by its heat, and stiffened by its frigidity.[7]

But it is chiefly by the predominance of some peculiar vapour, that the air becomes unfit for human support. It is often found, by dreadful experience, to enter into the constitution, to mix with its juices, and to putrefy the whole mass of blood. The nervous system is not less affected by its operations; palsies and vertigoes are caused by its damps; and a still more fatal train of distempers by its exhalations. In order that the air should be wholesome, it is necessary, as we have seen, that it should not be of one kind, but the compound of several substances; and the more various the composition, to all appearance, the more salubrious. A man, therefore, who continues in one place, is not so likely to enjoy this wholesome variety, as he who changes his situation; and, if I may so express it, instead of waiting for a renovation of air, walks forward to meet its arrival. This mere motion, independent even of the benefits of exercise, becomes wholesome, by thus applying a great variety of that healthful fluid by which we are sustained.

A thousand accidents are found to increase these bodies of vapour, that make one place more or less wholesome than another. Heat may raise them in too great quantities; and cold may stagnate them. Minerals may give off their effluvia in such proportion as to keep away all other kind of air; vegetables may render the air nwholesome by their supply; and animal putre- ction seems to furnish a quantity of vapour, at ast as noxious as any of the former. All these nited, generally make up the mass of respira- on, and are, when mixed together, harmless; t any one of them, for a long time singly pre- ominant, becomes at length fatal.

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[6] Boyle's Physico-Mechan. vol. ii. p. 598.

[7] Professor Olmstead remarks: "In England, the only natural temperature that is agreeable, lies between 60° and 70°, so that when the thermometer is above 70°, the inhabitants begin to feel uncomfortably warm, and when it is below 60°, they begin to approach the fire. In this climate, (lat. 35° 40′ N., long. 79° 3′ W.,) we do not feel uncomfortably warm until the thermometer is above 80°; and we begin to kindle fires when it is below 70°. It would seem, therefore, that our standard in this respect is 10° higher than it is in England; and that we do not suffer more by a heat of 90° than the people of England do by a heat of 80°. Dr. Black also remarks, that, in Scotland, the thermometer rises, in moderately warm summer air, to 64°. According to this account, what would be esteemed moderately warm summer-weather in Scotland, would be considered cool autumnal weather in this climate, when the presence of a fire would be quite comfortable, and almost necessary. It seems, moreover, agreeable to the analogy of nature, that the animal system should accommodate itself, in some measure, to the external circumstances in which it is placed."—Ed.

The effects of heat in producing a noxious ality in the air are well known. Those torrid gions under the Line are always unwholesome. t Senegal, I am told, the natives consider forty a very advanced time of life, and generally die old age at fifty. At Carthagena,[8] in America, here the heat of the hottest day ever known in urope is continual, where, during their winter ason, these dreadful heats are united with a ntinual succession of thunder, rain, and tem- sts, arising from their intenseness, the wan d livid complexions of the inhabitants might ake strangers suspect that they were just re- vered from some dreadful distemper: the ac- ons of the natives are conformable to their lour; in all their motions there is somewhat laxed and languid: the heat of the climate en affects their speech, which is soft and slow, d their words generally broken. Travellers om Europe retain their strength and ruddy lour in that climate, possibly for three or four onths; but afterwards suffer such decays in th, that they are no longer to be distinguished om the inhabitants by their complexion. How- ver, this languid and spiritless existence is fre- uently drawled on sometimes even to eighty. oung persons are generally most affected by e heat of the climate, which spares the more ged; but all, upon their arrival on the coasts, re subject to the same train of fatal disorders. ew nations have experienced the mortality of ese coasts so much as our own: in our unsuc- ssful attack upon Carthagena, more than three arts of our army were destroyed by the climate lone; and those that returned from that fatal xpedition, found their former vigour irretriev- bly gone. In our more fortunate expedition, hich gave us the Havannah, we had little rea- on to boast of our success; instead of a third, ot a fifth part of the army were left survivors f their victory, the climate being an enemy that ven heroes cannot conquer.

The distempers that thus proceed from the ruel malignity of those climates, are many: that, r instance, called the *Chapotonadas*, carries off multitude of people; and extremely thins the rews of European ships, whom gain tempts into hose inhospitable regions. The nature of this istemper is but little known, being caused in ome persons by cold, in others by indigestion. ut its effects are far from being obscure; it is enerally fatal in three or four days; upon its seiz- ng the patient, it brings on what is there called he *black vomit*, which is the sad symptom after which none are ever found to recover. Some, when the vomit attacks them, are seized with a delirium, that, were they not tied down, they would tear themselves to pieces, and thus expire in the midst of this furious paroxysm. This disorder, in milder climates, takes the name of the *bilious fever*, and is attended with milder symptoms, but very dangerous in all.

There are many other disorders incident to the human body, that seem the offspring of heat; but to mention no other, that very lassitude which prevails in all the tropical climates, may be considered as a disease. The inhabitants of India,[9] says a modern philosopher, sustain an unceasing languor, from the heats of their climate, and are torpid in the midst of profusion. For this reason, the great Disposer of nature has clothed their country with trees of an amazing height, whose shade might defend them from the beams of the sun; and whose continual freshness might, in some measure, temperate their fierceness. From these shades, therefore, the air receives refreshing moisture, and animals a cooling protection. The whole race of savage animals retire in the midst of the day, to the very centre of the forests, not so much to avoid their enemy man, as to find a defence against the raging heats of the season. This advantage which arises from shade in torrid climates, may probably afford a solution for that extraordinary circumstance related by Boyle, which he imputes to a different cause. In the island of Ternate, belonging to the Dutch, a place that had been long celebrated for its beauty and healthfulness, the clove-trees grew in such plenty, that they in some measure lessened their own value: for this reason, the Dutch resolved to cut down the forests, and thus to raise the price of the commodity: but they had soon reason to repent of their avarice; for such a change ensued, by cutting down the trees, that the whole island from being healthy and delightful, having lost its charming shades, became extremely sickly, and has actually continued so to this day. Boerhaave considered heat so prejudicial to health, that he was never seen to go near a fire.

An opposite set of calamities are the consequence, in climates where the air is condensed by cold. In such places, all that train of distempers which are known to arise from obstructed perspiration, are very common;[10] eruptions, boils, scurvy, and a loathsome leprosy, that covers the whole body with a scurf, and white putrid ulcers. These disorders also are infectious; and, while they thus banish the patient from society, they generally accompany him to the grave. The men of those climates seldom attain to the age of fifty; but the women, who do not lead such laborious lives, are found to live longer.

The autumnal complaints which attend a wet summer, indicate the dangers of a moist air. The long continuance of an east wind also, shows the prejudice of a dry one. Mineral exhalations, when copious, are everywhere known to be fatal; and although we probably owe the increase and luxuriance of vegetation to a moderate degree of their warmth, yet the natives of those countries where there are mines in plenty, but too often experience the noxious effects of their vicinity. Those trades also that deal in the preparations of metals of all kinds, are always unwholesome; and the workmen, after some time, are generally seen to labour under palsies, and other nervous complaints. The vapours from some vegetable substances are well known to be attended with dangerous effects. The shade of the manchineel tree, in America, is said to be fatal, as was that of the juniper, if we may credit the ancients. Those who walk through fields of poppies, or in any manner prepare those flowers for making opium, are very sensibly affected with the drowsiness they occasion. A physician of Mr. Boyle's acquaintance, causing a large quantity of black hellebore to be pounded in a mortar, most of the persons who were in the room, and especially the person who pounded it, were purged by it, and some of them strongly. He also gathered a certain plant in Ireland, which the person who beat in a mortar, and the physician who was standing near, were so strongly affected by, that their hands and faces swelled to an enormous size, and continued tumid for a long time after.

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[8] Ulloa, vol. i. p. 42.

[9] Linnæi Amœnitates, vol. v. p. 444.

[10] Crantz's History of Greenland, vol. i. p. 235

But neither mineral nor vegetable steams are so dangerous to the constitution, as those proceeding from animal substances, putrefying either by disease or death. The effluvia that comes from diseased bodies propagate that frightful catalogue of disorders which are called *infectious.* The parts which compose vegetable vapours and mineral exhalations, seem gross and heavy, in comparison of these volatile vapours, that go to great distances, and have been described as spreading desolation over the whole earth. They fly everywhere; penetrate everywhere; and the vapours that fly from a single disease, soon render it epidemic.

The plague is the first upon the list of this class of human calamities. From whence this scourge of man's presumption may have its beginning, is not well known: but we well know that it is propagated by infection. Whatever be the general state of the atmosphere, we learn from experience, that the noxious vapours, though but singly introduced at first, taint the air by degrees; every person infected tends to add to the growing malignity; and as the disorder becomes more general, the putrescence of the air becomes more noxious, so that the symptoms are aggravated by continuance. When it is said that the origin of this disorder is unknown, it implies that the air seems to be but little employed in first producing it. There are some countries, even in the midst of Africa, that we learn have never been infected with it; but continue for centuries unmolested. On the contrary, there are others that are generally visited once a-year, as in Egypt, which, nevertheless, seems peculiarly blessed with the serenity and temperature of its climate. In the former countries, which are of vast extent, and many of them very populous, every thing should seem to dispose the air to make the plague continual among them. The great heats of the climate, the unwholesomeness of the food, the sloth and dirt of the inhabitants, but, above all, the bloody battles which are continually fought among them, after which heaps of dead bodies are left unburied, and exposed to putrefaction. All these, one might think, would be apt to bring the plague among them; and yet, nevertheless, we are assured by Leo Africanus, that in Numidia the plague is not known once in a hundred years; and that in Negroland it is not known at all. This dreadful disorder, therefore, must have its rise, not from any previous disposition of the air, but from some particular cause, beginning with one individual, and extending the malignity by communication, till at last the air becomes actually tainted by the generality of the infection.

The plague which spread itself over the whole world, in the year 1346, as we are told by Mezeray, was so contagious, that scarcely a village, or even a house, escaped being infected by it. Before it had reached Europe, it had been for two years travelling from the great kingdom of Cathay, where it began by a vapour most horribly fetid: this broke out of the earth like a subterranean fire, and upon the first instant of its eruption consumed and desolated above two hundred leagues of that country, even to the trees and stones.

In that great plague which desolated the city of London, in the year 1665, a pious and learned schoolmaster, of Mr. Boyle's acquaintance, who ventured to stay in the city, and took upon him the humane office of visiting the sick and the dying, who had been deserted by better physicians, averred, that being once called to a poor woman who had buried her children of the plague, he found the room where she lay so little, that it scarcely could hold any more than the bed whereon she was stretched. However, in this wretched abode, beside her, in an open coffin, her husband lay, who had some time before died of the same disease; and whom she, poor creature, soon followed. But what showed the peculiar malignity of the air, thus suffering from animal putrefaction, was, that the contagious steams had produced spots on the very wall of their wretched apartment: and Mr. Boyle's own study, which was contiguous to a pesthouse, was also spotted in the same frightful manner. Happily for mankind, this disorder, for more than a century, has not been known in our island: and for this last age, has abated much of its violence, even in those countries where it is most common. Diseases, like empires, have their revolutions; and those which for awhile were the scourge of mankind, sink unheard of, to give place to new ones, more dreadful, as being less understood.

For this revolution in disorders, which has employed the speculation of many, Mr. Boyle accounts in the following manner: "Since," says he, "there want not causes in the bowels of the earth, to make considerable changes amongst the materials that nature has plentifully treasured up in those magazines, and as those noxious steams are abundantly supplied to the surface, it may not seem improbable, that in this great variety some may be found capable of affecting the human frame in a particular manner, and thus of producing new diseases. The duration of these may be greater or less, according to the lastingness of those subterraneous causes that produced them. On which account, it need be no wonder that some diseases have but a short duration, and vanish not long after they appear; whilst others may continue longer, as having under ground more settled and durable causes to maintain them."

From the recital of this train of mischiefs produced by the air upon minerals, plants, animals, and man himself, a gloomy mind may be apt to dread this indulgent nurse of nature as a cruel and inexorable stepmother: but it is far otherwise; and, although we are sometimes injured, yet almost all the comforts and blessings of life spring from its propitious influence. It would be needless to observe, that it is absolutely necessary for the support of our lives; for of this every moment's experience assures us. But how it contributes to this support, is not so readily comprehended. All allow it to be a friend, to whose benefits we are constantly obliged; and yet, to this hour, philosophers are divided as to the nature of the obligation. The dispute is, whether the air is only useful by its weight to force our juices into circulation;[11] or whether, by containing a peculiar spirit, it mixes with the blood in our vessels, and acts like a spur to their industry.[12] Perhaps it may exert both these useful offices at the same time. Its weight may give the blood its progressive motion through the larger vessels of the body; and its admixture with it cause those contractions of all the vessels, which serve to force it still more strongly forward, through the minutest channels of the circulation. Be this as it may, it is well known, that that part of our blood which has just received the influx of the air in our bodies, is of a very different colour from that which has almost performed its circuit. It has been found, that the arterial blood, which has been immediately mixed with the air in the lungs, and, if I may so express it, is just beginning its journey through the body, is of a fine florid scarlet colour; while, on the contrary, the blood of the veins that is returning from having performed its duty, is of a blackish crimson hue. Whence this difference of colour should proceed, is not well understood; we only know the fact, that this florid colour is communicated by the air; and we are well convinced, that this air has been admitted into the blood for very useful purposes.

Besides this vital principle in animals, the air also gives life and body to flame. A candle quickly goes out in an exhausted receiver; for having soon consumed the quantity of air, it then expires for want of a fresh supply. There has been a flame contrived that will burn under water; but none has yet been found that will continue to burn without air. Gunpowder, which is the most catching and powerful fire we know, will not go off in an exhausted receiver; nay, if a train of gunpowder be laid, so as that one part may be fired in the open air, yet the other part in vacuo will remain untouched and unconsumed. Wood also set on fire, immediately goes out; and its flame ceases upon removing the air; for something is then wanting to press the body of the fire against that of the fuel, and to prevent the too speedy diffusion of the flame. We frequently see cooks and others, whose business it is to keep up strong fires, take proper precautions to exclude the beams of the sun from shining upon them, which effectually puts them out. This they are apt to ascribe to a wrong cause; namely, the operation of the light: but the real fact is, that the warmth of the sun-beams lessens and dissipates the body of the air that goes to feed the flame; and the fire, of consequence, languishes for want of a necessary supply.

The air, while it thus kindles fire into flame, is, notwithstanding, found to moderate the rays of light, to dissipate their violence, and to spread a uniform lustre over every object. Were the beams of the sun to dart directly upon us, without passing through this protecting medium, they would either burn us up at once, or blind us with their effulgence. But by going through the air, they are reflected, refracted, and turned from their direct course, a thousand different ways; and thus are more evenly diffused over the face of nature.[13]

Among the other necessary benefits the air is of to us, one of the principal is, its conveyance of sound. Even the vibrations of a bell, which have the loudest effect that we know of, cease to be heard when under the receiver of an air-pump. Thus all the pleasures we receive from conversation with each other, or from music, depend entirely upon the air.[14]

Odours likewise are diffused only by the means of air; without this fluid to swim in, they would for ever remain torpid in their respective substances; and the rose would affect us with as little sensations of pleasure, as the thorn on which it grew.

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[11] Keil. Robinson.

[12] Whytt upon Vital and Involuntary Motions.

[13] See Supplementary Note B, p. 157.

[14] See Supplementary Note C, p. 158.

Those who are willing to augment the catalogue of the benefits we receive from this element, assert also, that tastes themselves would be insipid, were it not that the air presses their parts upon the nerves of the tongue and palate, so as to produce their grateful effects. Thus, continue they, upon the tops of high mountains, as on the Peak of Teneriffe, the most poignant bodies, as pepper, ginger, salt, and spice, have no sensible taste, for want of their particles being thus sent home to the sensory. But we owe the air sufficient obligations, not to be studious of admitting this among the number; in fact, all substances have their taste, as well on the tops of mountains, as in the bottom of the valley; and I have been one of many, who have ate a very savoury dinner on the Alps.

It is sufficient, therefore, that we regard the air as the parent of health and vegetation; as a kind dispenser of light and warmth; and as the conveyer of sounds and odours. This is an element of which avarice will not deprive us; and which power cannot monopolize. The treasures of the earth, the verdure of the fields, and even the refreshments of the stream, are too often seen going only to assist the luxuries of the great; while the less fortunate part of mankind stand humble spectators of their encroachments. But the air no limitations can bound, nor any landmarks restrain. In this benign element, all mankind can boast an equal possession; and for this we all have equal obligations to Heaven. We consume a part of it for our own sustenance, while we live; and, when we die, our putrefying bodies give back the supply, which, during life, we had accumulated from the general mass.

NOTE A.—*On the Atmosphere.*

Atmospherical air was long considered as a simple elementary body. But it is now known to consist of at least four distinct substances, namely, oxygen, azote, carbonic acid, and aqueous vapour. The first two substances must be considered as its essential constituents, and constitute in fact almost the whole of it. The other two are variable in their proportion, and exist only in minute quantities, which it is difficult to appreciate. The first knowledge of the composition of the atmosphere, must have been after the period of the discovery of oxygen gas by Dr. Priestley, in 1774. Lavoisier, indeed, in his posthumous works, appears to insinuate a knowledge of it in 1772. But this claim cannot be admitted, as he gives no hint of any such knowledge in his volume of essays published after that period, and as he was entirely unacquainted with oxygen gas when Priestley showed him the way to prepare it at Paris, about the end of 1774. It is very probable that Lavoisier became acquainted with the composition of atmospherical air not very long after that period; though some years elapsed before he made it known to the public. Whether he preceded Scheele in his knowledge of this important fact, we do not exactly know. But there is no doubt whatever, that Scheele's investigations were carried on without any assistance from abroad, and that it was in consequence of the publication of his treatise on Air and Fire, that the chemical world became acquainted with the nature and composition of atmospherical air. This important work was printed at Upsal, in 1777, with an introduction by Bergmann, and translated into English by Dr. Foster, in 1780. The experiments of Priestley, indeed, would have warranted the conclusions respecting the composition of atmospherical air drawn by Scheele; but those of Dr. Priestley were different and more complicated. In Scheele's first experiments, he estimated the bulk of oxygen gas in air at 30 per cent. But in the year 1779, he published a set of experiments continued for a whole year, in order to ascertain whether the bulk of oxygen in air be constant, or varies with the season of the year. He found it in general remarkably constant, and amounting to 27 per cent. The smallest bulk was 24, and the greatest observed was 30 per cent. Dr. Priestley had made similar experiments, and had estimated the bulk of the oxygen at ⅕ of the air, or 20 per cent. Mr. Lavoisier's experiments, which were very numerous and varied, almost coincided with those of Scheele. He considered air as composed of 27 parts by bulk of oxygen, and 73 of azote. Mr. Cavendish's experiments were published in the Philosophical Transactions for 1783. He proved decisively, that the proportion of the azote and oxygen in the atmosphere does not vary; and by a very careful analysis, concluded that 100 parts of air in bulk are composed of

79·16 azote
20·84 oxygen
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100·00

This opinion was not at first acceded to by chemists, misled by the previous conclusions of Scheele and Lavoisier; and it was not till towards the commencement of the 19th century, that the true proportion of these constituents was generally known. The experiments of Berthollet in Egypt and in Paris, seem to have led the way to it. These were almost immediately confirmed by those of Davy, Beddoes, and many other chemists. At present, it is universally admitted, that atmospheric air never varies in its composition; that it is the same in all places, and in all seasons; and that it consists in bulk of

79 azote
21 oxygen
———
100

proportions almost exactly the same with those originally settled by Mr. Cavendish.

Oxygen gas is undoubtedly the most important of the constituents of the atmosphere, and indeed one of the most remarkable substances in nature, and highly worthy of the investigation of the chemist. Dr. Priestley, its original discoverer, gave it the name of *dephlogisticated air*, Scheele called it *empyreal air*, Lavoisier called it at first *highly respirable air*, then *vital air*, and at last *oxygen gas*, because he considered it as the acidifying principle. It possesses the mechanical properties of common air; combustibles burn in it with great brilliancy; and animals can breathe it much longer than the same quantity of common air. If the specific gravity of common air be reckoned 1·000, that of oxygen gas, according to the experiments of Kirwin and Lavoisier, is 1·103; according to Davy, 1·127; according to Fourcroy, Vauquelin, and Seguin, 1·087; and according to Allen and Pepys, 1·090. These results do not differ much from each other except that of Mr. Davy. His oxygen was obtained from the black oxide of manganese, and might perhaps contain a little carbonic acid gas. If we exclude his, the average of the other three is 1·093. This may be considered as near the truth as can well be attained. Rating its specific gravity at 1·093, 100 cubic inches of it, at the temperature of 60° when the barometer stands at 30 inches, will weigh 33⅓ grains troy.

Azotic gas, the other constituent of atmospherical air, is chiefly recognised by its negative qualities. It possesses the mechanical properties of air; it does not support combustion; and no animal can breathe it without death. It constitutes the base of nitric acid, and is one of the constituents of ammonia. There is reason to consider it as a compound body, but hitherto chemists have not been able to ascertain its constituents; though several extraordinary phenomena, observed during the decomposition of ammonia by Davy and Berzelius, cannot well be accounted for, without supposing hydrogen to be a constituent of it. The specific gravity of azotic gas according to Kirwan, is 0·985, that of air being 1·000; while, according to Lavoisier and Davy it is 0·978. This last estimate we are disposed to consider as most correct. If so, 100 cubic inches of it, at the temperature of 60° when the barometer stands at 30 inches, weigh 29·83 grains troy. Reckoning the specific gravity of oxygen gas 1·093, and that of azotic gas 0·978, and supposing atmospherical air to be composed of 79 parts of azote, and 21 oxygen by bulk, it follows, that 100 parts of it in weight, are composed of

77·43	azote
22·57	oxygen
100·00	

The third constituent of the atmosphere is carbonic acid gas. Its presence in the atmosphere was recognised as soon as Dr. Black had ascertained the cause of the difference between mild and caustic alkalies; for it was known that a caustic alkali soon becomes mild by exposure to the air. Dr. Black ascertained that the mildness is owing to the absorption of carbonic acid. From the observations of Saussure we learn, that this gas exists in the atmosphere on the summit of Mount Blanc, which is nearly 16,000 feet above the level of the sea; for lime-water soon deposited its lime in the state of carbonate, when exposed upon the summit of that mountain (Saussure's Voyages, iv. 199). Humboldt found it in a quantity of air brought down by Garnerin from a height of 4,280 feet, to which he had ascended in an air-balloon. ('Jour. de Phys.' xlvii. 202.) It appears, therefore, to constitute a part of every portion of the atmosphere to which we have access. As this acid gas is produced in great quantities by combustion, respiration, fermentation, and many other of the most common processes of nature, one would be disposed to believe, at first view, that its quantity must be constantly increasing. But this does not appear to be the case; it must therefore be decomposed and separated from air as fast as it is formed. It is of so deleterious a nature, that, if it were to accumulate to any extent, it would render air incapable of supporting life. A candle will not burn in air contaminated with one-ninth of carbonic acid gas. The quantity of this gas in air is small. Many attempts have been made to ascertain it; but the process is so difficult, that absolute precision cannot be looked for. It was long believed that the carbonic acid present in the atmosphere amounted to one per cent. Humboldt made many experiments on the subject, and concluded from them, that its bulk varied from one per cent to half a per cent. But this determination is certainly excessive. According to the experiments of Mr. Dalton, a quantity of air, equal in bulk to 102,400 grains of water, contains a quantity of carbonic acid just capable of saturating 125 grains of lime-water; 70 measures of carbonic acid gas would produce the same effect: hence he concludes, that the atmosphere contains $\frac{1}{1400}$th part of its bulk of carbonic acid gas. (Phil. Mag. xxiii. 354.) This quantity we consider as rather below the truth. Mr. Cavendish has shown, that lime-water is not capable of depriving air completely of carbonic acid gas: hence a portion would still remain in Mr. Dalton's experiment. Perhaps we shall not err far if we state the bulk of carbonic acid gas in the atmosphere at $\frac{1}{1000}$th part.

The fourth constituent of the atmosphere is water in the state of vapour. That water forms a constituent part of the atmosphere, has been known in all ages, and indeed is demonstrated by the rain and dew which is continually falling, and by the great quantity of moisture which sulphuric acid, potash, and other bodies, absorb when exposed to the atmosphere. The quantity of moisture in the atmosphere has been observed to vary greatly at different times, and various instruments have been invented to measure that quantity. These instruments are called *hygrometers*. The most ingenious of them are those of Leslie, Saussure, and De Luc. It was at first supposed that the water in the atmosphere was still in a state of water, and that it was held in solution in air precisely as salts are dissolved in water. But it has been at last established by satisfactory experiments, that the water in the atmosphere is in the state of vapour. To De Luc, Saussure, and Dalton, we are chiefly indebted for these experiments. As to the quantity of water which exists in the atmosphere, it depends upon a variety of circumstances. Saussure found that a cubic foot of air, saturated with moisture at 66°, contains about 8 grains troy of water, or $\frac{1}{67}$th of its weight. Supposing air always saturated with moisture, the quantity always increases with the temperature, because the elasticity of aqueous vapour increases with the temperature. Hence, in cold weather, the quantity of vapour in air is always small; whereas, in warm weather, it is often considerable. In the torrid zone, the aqueous vapour in the atmosphere is capable of supporting from 0·6 to 1 inch of mercury. In Britain it is hardly ever capable of supporting 0·6 inch of mercury; but in summer it is often capable of supporting 0·5 inch, while in winter it often does not exceed 0·1 inch. From these facts it follows, that the weight of water present in the atmosphere varies from $\frac{1}{60}$ to $\frac{1}{300}$ of the whole. Mr. Dalton supposes, that the medium quantity of vapour held in solution at once in the atmosphere, may amount to $\frac{1}{70}$th of its bulk.

These four bodies, oxygen, azote, carbonic acid, and vapour, are the only known constituents of the atmosphere. It cannot be doubted that other bodies are occasionally present in it. The dreadful effects of marshy situations on the health of the inhabitants, and the fatal rapidity with which certain diseases are propagated, cannot well be accounted for, without supposing that certain substances which produce a deleterious effect on the animal economy, are occasionally present in the atmosphere. But hitherto no method has been discovered of ascertaining the presence of these bodies, and subjecting them to examination. They are too subtile for our apparatus, and altogether escape the cognizance of our senses. It has been ascertained, however, that certain acid fumes, as those of the muriatic acid, nitric acid, and above all, of the oxymuriatic acid, have the property of destroying these miasmata, or, at least, of preventing them from producing deleterious effects on the animal economy.

NOTE B.—*Refraction.*

When a ray of light enters the atmosphere, it is bent from its course by the same cause which refracts the rays of light when they pass through any dense medium, such as glass or water. The refraction sustained by light at its first entrance into the atmosphere must be very small, from the extreme rarity of the air. The deviation, however, will gradually increase, as it penetrates the denser strata, and the ray will describe a path increasing in curvature as it approaches the earth. From this property of the atmosphere, the apparent altitude of the sun, moon, and stars, is greater than their real elevation, and they appear to be raised above the horizon when they are actually below it. The refraction of the atmosphere near the earth's surface is liable to very considerable anomalies. A very extraordinary phenomenon arising from this cause has been described by Mr. Vince. The castle of Dover, concealed by the hill which lies between it and Ramsgate, appeared, on the 6th of August, 1806, as if it had been brought over and placed on the side of the hill next to Ramsgate. This phenomenon must have arisen from some variety of density in the intermediate air. Phenomena of the same class with the preceding have been illustrated experimentally by the ingenious Dr. Wollaston. See 'Edinburgh Transactions,' vol. vi. p. 245; and 'Phil. Trans.' 1778, p. 357; 1798. But while the solar rays traverse the earth's atmosphere, they suffer another change from the resisting medium which they encounter. When the sun or any of the heavenly bodies are considerably elevated above the horizon, their light is transmitted to the earth without any perceptible change; but when these bodies are near the horizon, their light must pass through a long tract of air, and is considerably modified before it reaches the eye of the observer. The momentum of the red or greatest refrangible rays, being greater than the momentum of the violet, or least refrangible rays, the former will force their way through the resisting medium, while the latter will be either reflected or absorbed. A white beam of light therefore, will be deprived of a portion of its blue rays by its horizontal passage through the atmosphere, and the resulting colour will be either orange or red, according to the quantity of the least refrangible rays that have been stopped in their course. Hence the rich and brilliant hue with which nature is gilded by the setting sun; hence the glowing red which tinges the morning and evening clouds; and hence the sober purple of twilight which they assume when their ruddy glare is tempered by the reflected azure of the sky.

We have already seen that the red rays penetrate through the atmosphere, while the blue rays, less able to surmount the resistance which they meet, are reflected or absorbed in their passage. It is to this cause that we must ascribe the colour of the sky, and the bright azure which tinges the mountains of the distant landscape. As we ascend in the atmosphere, the deepness of the blue tinge gradually dies away; and to the aeronaut who has soared above the denser strata, or to the traveller who has ascended the Alps or the Andes, the sky appears of a deep black, while the blue rays find a ready passage through the attenuated strata of the atmosphere. It is owing to the same cause that the diver at the bottom of the sea is surrounded with the red light which has pierced through the superincumbent fluid, and that the blue rays are reflected from the surface of the ocean. Were it not for the reflecting power of the air, and of the clouds which float in the lower regions of the atmosphere, we should be involved in total darkness by the setting of the sun, and by every cloud that passes over his disc. It is to the multiplied reflections which the light of the sun suffers in the atmosphere, that we are indebted for the light of day when the earth is enveloped with impenetrable clouds. From the same cause arises the sober hue of the morning and evening twilight, which increases as we recede from the equator, till it blesses with perpetual day the inhabitants of the polar regions.

NOTE C.—*Sound.*

Every sound is rendered stronger or weaker, and may be heard at a greater or less distance, according to the density or rarity of that elastic fluid by which it is propagated. According to Mr. Hawksbee, who has made deep researches into this branch of philosophy, when air has acquired twice its common density, it transmits sound twice as far as common air; whence he reasonably concludes, that sound increases, not only in direct proportion to the density of the air, but in proportion to the square of this density. If sound was propagated in an elastic fluid more dense than the air, it would be carried proportionably farther. M. Brisson has proved this, by putting a sonorous body into carbonic acid gas, the density of which is about one-third more than that of atmospheric air; the consequence was, that at that time, and in that situation, the sound was very considerably increased. For this reason the dryness of the air, which increases its density, has a considerable effect in rendering sound louder and more audible. Sound is also much increased by the reverberation of the pulses of the air from those surrounding bodies against which they strike; whence it happens, music is so much louder in a close apartment than in the open air.

A knowledge of the progression of sound is not a subject of mere sterile curiosity, but is in several instances useful; for by this we are enabled to determine the distance of ships or other moving bodies. Suppose, for example, a vessel fires a gun, the sound of which is heard five seconds after the flash is seen; as sound moves 1,142 English feet in one second, this number multiplied by five, gives the distance of 5,710 feet. The same principle has been already mentioned as applicable in storms of lightning and thunder.

The waves or pulses of sound being reflexible in their course, when they meet with an extended solid body of a regular surface, an ear placed in the passage of these reflected waves, will perceive a sound similar to the original sound, but which will seem to proceed from a body situated in a similar position and distance behind the place of reflection,[*] as the real sounding body is before it. This reflected sound is commonly called an *Echo*, which, however, cannot take place at less than fifty-five feet; because it is necessary that the distance should be such, and the reverberated or reflected sound so long in arriving, that the ear may distinguish clearly between that and the original sound.

It is in general known, that caverns, grottoes, mountains, and ruined buildings, return this image of sound. Image we may call it, for in every respect it resembles the image of a visible object reflected from a polished surface. Our figures are often represented in a mirror without seeing them ourselves, while those standing on one side are alone sensible of the reflection. To be capable of seeing the reflected image of ourselves, we must be directly in a line with the image. Just so it is in an echo; we must stand in the line in which the sound is reflected, or the repetition will be lost to us, while it may, at the same time, be distinctly heard by others who stand at a small distance to one side of us. There is a very extraordinary echo at a ruined fortress near Louvain, in Flanders. If a person sing, he only hears his own voice, but then he hears it with surprising variations, sometimes louder, sometimes softer, now more near, then more distant. There is an account in the Memoirs of the French Academy, of a similar echo near Rouen. The building which returns it is a semicircular court-yard; yet all the buildings of the same form do not produce the same effects. We find some music halls excessively adapted for sounds, while others, built upon the same plan, in a different place, are found to resist the tones, instead of enlarging them, in a very disagreeable manner.

As we know the distance of places by the length of time a sound takes to travel from them, so we may judge of the distance of an echo by the length of the interval between our voice and its repetition. The most deliberate echoes, as they are called, are ever the most distant; while, on the contrary, those that are very near, return their sound so very quick as to have the interval almost imperceptible: when this is the case, and the echo is so very near, the voice is said to be increased and not echoed; however, in fact, the increase is only made by the swiftly pursuing repetition. Our theatres and concert-rooms are best fitted for music or speaking, when they enlarge the sound to the greatest pitch in the smallest interval: for a repetition which does not begin the word till the speaker has finished it, throws all the sounds into confusion. Thus the theatre at the Hay-market, in London, enlarges the sound very much; but then at a long interval after the singer or speaker. The old theatre at Drury-lane, before it was altered, enlarged the sound but in a small degree; but then the repetition was extremely quick in its pursuit, and the sounds, when heard, were therefore heard distinctly. Dergolise, the great musical composer, used to say, that an echo was the best school-mistress; for let a man's own music be ever so good, by playing to an echo she would teach him to improve it.

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[*] Sound is reflected in the same direction as light from a mirror; that is, the angle of reflection is equal to the angle of incidence.

Reflected sounds may be magnified by much the same contrivances as are used in optics respecting light: hence it follows, that sounds uttered at one focus of an elliptical cavity, are heard much magnified in the other focus. The whispering gallery at St. Paul's Cathedral, in London, is of this description; a whisper uttered at one side of the dome, is reflected to the other, and may be very distinctly heard. The speaking and ear trumpets are constructed on this principle. The best form for these instruments is a hollow parabolic conoid, with a small orifice at the top or apex, to which the mouth is applied when the sound is to be magnified, or the ear when the hearing is to be facilitated.

CHAP. XX.

OF WINDS, IRREGULAR AND REGULAR.

WIND is a current of air. Experimental philosophers produce an artificial wind by an instrument called an *æolipile*. This is nothing more than a hollow copper ball, with a long pipe; a tea-kettle might be readily made into one, if it were entirely closed at the lid, and the spout left open: through this spout it is to be filled with water, and then set upon the fire, by which means it produces a violent blast, like wind, which continues while there is any water remaining in the instrument. In this manner water is converted into a rushing air; which, if caught as it goes out, and left to cool, is again quickly converted into its former element. Besides this, as was mentioned in the former chapter, almost every substance contains some portions of air. Vegetables, or the bodies of animals left to putrefy, produce it in a very copious manner. But it is not only seen thus escaping from bodies, but it may be very easily made to enter into them. A quantity of air may be compressed into water, so as to be intimately blended with it. It finds a much easier admission into wine, or any fermented liquor: and an easier still into spirits of wine. Some salts suck up the air in such quantities, that they are made sensibly heavier thereby, and often are melted by its moisture. In this manner, most bodies being found either capable of receiving or affording it, we are not to be surprised at those streams of air that are continually fleeting round the globe.—Minerals, vegetables, and animals, contribute to increase the current; and are sending off their constant supplies. These, as they are differently affected by cold or heat, by mixture or putrefaction, all yield different quantities of air at different times; and the loudest tempests, and most rapid whirlwinds, are formed from their united contributions.

The sun is the principal instrument in rarefying the juices of plants, so as to give an escape to their imprisoned air; it is also equally operative in promoting the putrefaction of animals. Mineral exhalations are more frequently raised by subterranean heat. The moon, the other planets, the seasons, are all combined in producing these effects in a smaller degree. Mountains give a direction to the courses of the air. Fires carry a current of air along their body. Night and day alternately chill and warm the earth, and produce an alternate current of its vapours. These, and many other causes, may be assigned for the variety and the activity of the winds, their continual change, and uncertain duration.

With us on land, as the wind proceeds from so many causes, and meets such a variety of obstacles, there can be but little hopes of ever bringing its motions to conform to theory; or of foretelling how it may blow a minute to come. The great Bacon, indeed, was of opinion, that by a close and regular history of the winds, continued for a number of ages together, and the particulars of each observation reduced to general maxims, we might at last come to understand the variations of this capricious element; and that we could foretell the certainty of a wind with as much ease as we now foretell the return of an eclipse. Indeed, his own beginnings in this arduous undertaking seem to speak the possibility of its success; but, unhappily for mankind, this investigation is the work of ages, and we want a Bacon to direct the process.

To be able, therefore, with any plausibility, to account for the variations of the wind upon land, is not to be at present expected; and to understand any thing of their nature, we must have recourse to those places where they are more permanent and steady. This uniformity and steadiness we are chiefly to expect upon the ocean. There, where there is no variety of substances to furnish the air with various and inconstant supplies, where there are no mountains to direct the course of its current, but where all is extensively uniform and even; in such a place, the wind arising from a simple cause, must have but one simple motion. In fact, we find it so. There are many parts of the world where the winds, that with us are so uncertain, pay their stated visits. In some places they are found to blow one way by day, and another by night; in others, for one-half of the year they go in a direction contrary to their former course: but, what is more extraordinary still, there are some places where the winds never change, but for ever blow the same way. This is particularly found to obtain between the tropics in the Atlantic and Æthiopic oceans; as well as in the great Pacific sea.

Few things can appear more extraordinary to a person who has been out of our variable latitudes, than this steady wind, that for ever sits in the sail, sending the vessel forward; and as effectually preventing its return. He who has been taught to consider that nothing in the world is so variable as the winds, must certainly be surprised to find a place where there is nothing more uniform. With us their inconstancy has become a proverb; with the natives of those distant climates they may talk of a friend or a mistress as fixed and unchangeable as the winds, and mean a compliment by the comparison. When our ships are once arrived into the proper latitudes of the great Pacific ocean, the mariner forgets the helm, and his skill becomes almost useless: neither storms nor tempests are known to deform the glassy bosom of that immense sheet of waters; a gentle breeze, that for ever blows in the same direction, rests upon the canvass, and speeds the navigator. In the space of six weeks, ships are thus known to cross an immense ocean, that takes more than so many months to return. Upon returning, the trade-wind, which has been propitious, is then avoided; the mariner is generally obliged to steer into the northern latitudes, and to take the advantage of every casual wind that offers, to assist him into port. This wind, which blows with such constancy one way, is known to prevail not only in the Pacific ocean, but also in the Atlantic, between the coasts of Guinea and Brazil; and, likewise, in the Æthiopic ocean. This seems to be the great universal wind, blowing from the east to the west, that prevails in all the extensive oceans, where the land does not frequently break the general current. Were the whole surface of the globe an ocean, there would probably be but this one wind, for ever blowing from the east, and pursuing the motions of the sun westward. All the other winds seem subordinate to this; and many of them are made from the deviations of its current. To form, therefore, any conception relative to the variations of the wind in general, it is proper to begin with that which never varies.

There have been many theories to explain this invariable motion of the winds; among the rest we cannot omit that of Dr. Lyster, for its strangeness. "The sea," says he, "in those latitudes, is generally covered over with green weeds, for a great extent; and the air produced from the vegetable perspiration of these, produces the trade-wind." The theory of Cartesius was not quite so absurd. He alleged that the earth went round faster than its atmosphere at the equator; so that its motion, from west to east, gave the atmosphere an imaginary one from east to west; and thus an east wind was eternally seen to prevail. Rejecting those arbitrary opinions, conceived without force, and asserted without proof, Dr. Halley has given one more plausible; which seems to be the reigning system of the day.

To conceive his opinion clearly, let us for a moment suppose the whole surface of the earth to be an ocean, and the air encompassing it on every side, without motion. Now it is evident, that that part of the air which lies directly under the beams of the sun, will be rarefied; and if the sun remained for ever in the same place, there would be a great vacuity in the air, if I may so express it, beneath the place where the sun stood. The sun moving forward from east to west, this vacuity will follow too, and still be made under it. But while it goes on to make new vacuities, the air will rush in to fill up those the sun has already made; in other words, as it is still travelling forward, the air will continually be rushing in behind, and pursue its motions from east to west. In this manner the air is put into motion by day; and by night the parts continue to impel each other till the next return of the sun, that gives a new force to the circulation.

In this manner is explained the constant east wind that is found blowing round the globe, near the equator. But it is also known, that as we recede from the equator on either side, we come into a trade-wind, that continually blows from the poles, from the north on one side, or the south on the other, both directing towards the equator. This also proceeds from a similar cause with the former; for the air being more rarefied in those places over which the sun more directly darts its rays, the currents will come both from the north and the south, to fill up the intermediate vacuity.

These two motions, namely, the general one from east to west, and the more particular one from both the poles, will account for all the phenomena of trade-winds; which, if the whole surface of the globe were sea, would undoubtedly be constant, and for ever continue to blow in one direction. But there are a thousand circumstances to break these air-currents into smaller ones; to drive them back against their general course; to raise or depress them; to condense them into storms, or to whirl them into eddies. In consequence of this, regard must be often had to the nature of the soil, the position of the high mountains, the course of the rivers, and even to the luxuriance of vegetation.

If a country, lying directly under the sun, be very flat and sandy, and if the land be low and extensive, the heat occasioned by the reflection of the sunbeams produces a very great rarefaction of the air. The deserts of Africa, which are conformable to this description, are scarcely ever fanned by a breath of wind by day; but the burning sun is continually seen blazing in intolerable splendour above them. For this reason, all along the coasts of Guinea, the wind is always perceived blowing in upon the land, in order to fill up the vacuity caused by the sun's operation. In those shores, therefore, the wind blows in a contrary direction to that of its general current; and is constantly found setting in from the west.

From the same cause it happens, that those constant calms, attended with deluges of rain, are found in the same part of the ocean. For this tract being placed in the middle, between the westerly winds blowing on the coast of Guinea, and the easterly trade-winds that move at some distance from shore, in a contrary direction, the tendency of that part of the air that lies between these two opposite currents is indifferent to either, and so rests between both in torpid serenity; and the weight of the incumbent atmosphere, being diminished by the continual contrary winds blowing from hence, it is unable to keep the vapours suspended that are copiously borne thither; so that they fall in continual rains.

But it is not to be supposed, that any theory can account for all the phenomena of even those winds that are known to be most regular. Instead of a complete system of the trade-winds, we must rather be content with an imperfect history. These,[1] as was said, being the result of a combination of effects, assume as great a variety as the causes producing them are various.

Besides the great general wind above mentioned, in those parts of the Atlantic that lie under the temperate zone, a north wind prevails constantly during the months of October, November, December, and January. These, therefore, are the most favourable months for embarking for the East Indies, in order to take the benefit of these winds, for crossing the Line; and it has been often found by experience, that those who had set sail five months before, were not in the least farther advanced in their voyage, than those who waited for the favourable wind. During the winter, off Nova Zembla, and the other arctic countries, a north wind reigns almost continually. In the Cape de Verde islands, a south wind prevails during the month of July. At the Cape of Good Hope, a north-west wind blows during the month of September. There are also regular winds, produced by various causes, upon land. The ancient Greeks were the first who observed a constant breeze, produced by the melting of the snows, in some high neighbouring countries. This was perceived in Greece, Thrace, Macedonia, and the Ægean sea. The same kind of winds are now remarked in the kingdom of Congo, and the most southern parts of Africa. The flux and reflux of the sea also produces some regular winds, that serve the purposes of trade; and, in general, it may be observed, that wherever there is a strong current of water, there is a current of air that seems to attend it.[2]

Besides these winds that are found to blow in one direction, there are, as was said before, others that blow for certain months of the year one way, and the rest of the year the contrary way; these are called the *Monsoons*, from a famous pilot of that name, who first used them in navigation with success.[3] In all that part of the ocean that lies between Africa and India, the east winds begin at the month of January, and continue till about the commencement of June. In the month of August or September, the contrary direction takes place: and the west winds prevail for three or four months. The interval between these winds, that is to say, from the end of June to the beginning of August, there is no fixed wind; but the sea is usually tossed by violent tempests, proceeding from the north. These winds are always subject to their greatest variations, as they approach the land; so that on one side of the great peninsula of India, the coasts are, for near half the year, harassed by violent hurricanes and northern tempests: while, on the opposite side, and all along the coasts of Coromandel, these dreadful tempests are wholly unknown. At Java and Ceylon, a west wind begins to reign in the month of September; but at fifteen degrees of south latitude, this wind is found to be lost, and the great general trade-wind from the east is perceived to prevail. On the contrary, at Cochin, in China, the west wind begins in March; so that these monsoons prevail, at different seasons, throughout the Indies. So that the mariner takes one part of the year to go from Java to the Moluccas; another from Cochin to Molucca; another from Molucca to China; and still another to direct him from China to Japan.[4]

There are winds also that may be considered as peculiar to certain coasts; for example, the south wind is almost constant upon the coasts of Chili and Peru; western winds almost constantly prevail on the coast of Terra Magellanica, and in the environs of the Straits le Maire. On the coasts of Malabar, north and north-west winds prevail continually; along the coast of Guinea, the north-west wind is also very frequent; and, at a distance from the coasts, the north-east is always found prevailing. From the beginning of November to the end of December, a west wind prevails on the coasts of Japan; and, during the whole winter, no ships can leave the port of Cochin, on account of the impetuosity of the winds that set upon the coast. These blow with such vehemence, that the ports are entirely choked up with sand, and even boats are not able to enter. However, the east winds that prevail for the other half of the year, clear the mouths of their harbours from the accumulations of the preceding winter, and set the confined ships at liberty. At the straits of Babelmandel, there is a south wind that periodically returns, and which is always followed by a north-east.

Besides winds thus peculiar to certain coasts, there are others found to prevail on all the coasts, in warm climates, which during one part of the day, blow from the shore, and during another part of it blow from the sea. The sea-breeze, in those countries, as Dampier observes, commonly rises in the morning about nine, proceeding slowly in a fine small black curl, upon the surface of the water, and making its way to refresh the shore. It is gentle at first, but increases gradually till twelve, then insensibly sinks away, and is totally hushed at five. Upon its ceasing the land-breeze begins to take its turn, which increases till twelve at night, and is succeeded in the morning by the sea-breeze again. Without all doubt, nothing could have been more fortunate for the inhabitants of the warm countries where those breezes blow, than this alternate refreshment, which they feel at those seasons, when it is most wanted. The heat on some coasts would be insupportable, were it not for such a supply of air, when the sun has rarefied all that which lay more immediately under the coast. The sea-breeze temperates the heat of the sun by day; and the land-breeze corrects the malignity of the dews and vapours by night. Where these breezes, therefore, prevail, and they are very common, the inhabitants enjoy a share of health and happiness unknown to those that live much farther up the country, or such as live in similar latitudes without this advantage. The cause of these obviously seems to arise from the rarefaction of the air by the sun, as their duration continues with its appearance, and alters when it goes down. The sun, it is observed, equally diffusing his beams upon land and sea, the land being a more solid body than the water, receives a greater quantity of heat, and reflects it more strongly. Being thus, therefore, heated to a greater degree than the waters, it, of consequence, drives the air from land out to sea; but its influence being removed, the air returns to fill up the former vacuity. Such is the usual method of accounting for this phenomenon; but, unfortunately, these sea and land breezes are visitants that come at all hours. On the coasts of Malabar,[5] the land-breezes begin at midnight, and continue till noon; then the sea-breezes take their turn, and continue till midnight. While again, at Congo, the land-breezes begin at five, and continue till nine the next day.

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[1] Buffon, vol. ii. p. 230.

[2] See Supplementary Note A, p. 166.

[3] Varenii Geographia Generalis, cap. 20.

[4] See Supplementary Note B, p. 169.

But if the cause of these be so inscrutable, that are, as we see, tolerably regular in their visitations, what shall we say to the winds of our own climate, that are continually shifting, and incapable of rest? Some general causes may be assigned, which nothing but particular experience can apply. And in the first place, it may be observed, that clouds and heat, and in short, whatever either increases the density or the elasticity of the air, in any one place, will produce a wind there: for the increased activity of the air thus pressing more powerfully on the parts of it that are adjacent, will drive them forward, and thus go on, in a current, till the whole comes to an equality.

In this manner, as a denser air produces a wind, on the one hand; so will any accident, that contributes to lighten the air, produce it on the other: for a lighter air may be considered as a vacuity, into which the neighbouring air will rush: and hence it happens, that when the barometer marks a peculiar lightness in the air, it is no wonder that it foretells a storm.

The winds upon large waters are generally more regular than those upon land. The wind at sea generally blows with an even steady gale; the wind at land puffs by intervals, increasing its strength, and remitting it, without any apparent cause. This, in a great measure, may be owing to the many mountains, towers, or trees, that it meets in its way, all contributing either to turn it from its course, or interrupt its passage.

The east wind blows more constantly than any other, and for an obvious reason: all other winds are, in some measure, deviations from it, and partly may owe their origin thereto. It is generally, likewise, the most powerful, and for the same reason.

There are often double currents of the air. While the wind blows one way, we frequently see the clouds move another. This is generally the case before thunder; for it is well known that the thunder-cloud always moves against the wind: the cause of this surprising appearance has hitherto remained a secret. From hence we may conclude, that weathercocks only inform us of that current of the air which is near the surface of the earth; but are often erroneous with regard to the upper regions, and, in fact, Derham has often found them erroneous.

Winds are generally more powerful on elevated situations than on the plain, because their progress is interrupted by fewer obstacles. In proportion as we ascend the heights of a mountain, the violence of the weather seems to increase, until we have got above the region of storms, where all is usually calm and serene. Sometimes, however, the storms rise even to the tops of the highest mountains; as we learn from those who have been on the Andes, and as we are convinced by the deep snows that crown even the highest.

Winds blowing from the sea are generally moister, and more attended with rains, than those which blow over extensive tracts of land; for the sea gives off more vapours to the air, and these are rolled forward upon land by the wind's blowing from thence.[6] For this reason our easterly winds that blow from the continent are dry in comparison of those that blow from the surface of the ocean, with which we are surrounded on every other quarter.

In general the winds are more boisterous in spring and autumn than at other seasons: for at being the time of high tides, the sea may mmunicate a part of its motions to the winds. e sun and moon, also, which then have a great- effect upon the waters, may also have some luence upon the winds: for there being a great dy of air surrounding the globe, which, if con- nsed into water, would cover it to the depth of irty-two feet, it is evident that the sun and on will, to a proportionable degree, affect the mosphere, and make a tide of air. This tide ll be scarcely perceivable indeed; but, without ubt, it actually exists; and may contribute to crease the vernal and autumnal storms, which e then known to prevail.

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[5] Buffon, vol. ii. p. 252.

[6] Derham's Physico-Theol.

Upon narrowing the passage through which e air is driven, both the density and the swift- ss of the wind is increased. For, as currents water flow with greater force and rapidity by rrowing their channels; so also will a current air driven through a contracted space, grow re violent and irresistible. Hence we find ose dreadful storms that prevail in the defiles mountains, where the wind, pushing from be- nd through a narrow channel, at once increases speed and density, levelling or tearing up every stacle that rises to obstruct its passage.

Winds reflected from the sides of mountains d towers, are often found to be more forceful an those in direct progression. This we fre- ently perceive near lofty buildings, such as urches or steeples, where winds are generally own to prevail, and that much more power- lly than at some distance. The air in this case, striking against the side of the building, ac- ires additional density, and, therefore, blows th more force.

These different degrees of density, which the r is found to possess, sufficiently show that the rce of the winds does not depend upon their locity alone: so that those instruments called *emometers*, which are made to measure the ve- city of the wind, will by no means give us cer- in information of the force of the storm. In der to estimate this with exactness, we ought know its density; which also these are not lculated to discover. For this reason we often e storms, with very powerful effects, that do t seem to show any great speed; and, on the ntrary, we see these wind-measurers go round th great swiftness, when scarcely any damage s followed from the storm.[7]

Such is the nature and the inconstancy of the irregular winds, with which we are best acquainted. But their effects are much more formidable in those climates near the tropics, where they are often found to break in upon the steady course of the trade-winds, and to mark their passage with destruction. With us the tempest is but rarely known, and its ravages are registered as an uncommon calamity; but in the countries that lie between the tropics, and for a good space beyond them, its visits are frequent, and its effects are anticipated. In these regions the winds vary their terrors; sometimes involving all things in a suffocating heat; sometimes mixing all the elements of fire, air, earth, and water, together; sometimes, with a momentary swiftness, passing over the face of the country, and destroying all things in their passage; and sometimes raising whole sandy deserts in one country, to deposite them upon some other. We have little reason, therefore, to envy these climates the luxuriance of their soil, or the brightness of their skies. Our own muddy atmosphere, that wraps us round in obscurity, though it fails to gild our prospects with sunshine, or our groves with fruitage, nevertheless answers the call of industry. They may boast of a plentiful, but precarious, harvest; while with us, the labourer toils in a certain expectation of a moderate, but a happy, return.

In Egypt,[8] a kingdom so noted for its fertility, and the brightness of its atmosphere, during summer the south winds are so hot that they almost stop respiration; besides which, they are charged with such quantities of sand, that they sometimes darken the air as with a thick cloud.[9]

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[7] The following is a table of the different veloci- s and forces of the winds, according to their com- on appellations:

elocity—1 mile per hour	Hardly perceptible.
2	Just perceptible.
3	
4	Gentle pleasant wind.
5	
10	Pleasant brisk gale.
15	
20	Very brisk.
25	
30	High winds.
35	
40	Very high.
45	
50 miles per hour	A storm or tempest.
60	A great storm.
80	A hurricane.
100	A hurricane that tears up trees, and carries buildings before it.

The force of the wind is nearly as the square of the velocity, or but little above it, in these velocities. But the force is much more than in the simple ratio of the surfaces, with the same velocity, and this increase of the ratio is the more, as the velocity is the more. By accurate experiments with two planes, the one of 17¼ square inches, the other of 32, which are nearly in the ratio of 5 to 9, Dr. Hutton found their resistances, with a velocity of 20 feet per second, to be the one 1,196 ounces, and the other, 2,542 ounces: which are in the ratio of 8 to 17, being an increase of between one-fifth and one-sixth parts more than the ratio of the surfaces.—Ed.

[8] Buffon, vol. ii. p. 258.

[9] The most destructive wind of Egypt is what is called the *Kamsin*, which generally prevails in March, April, and May. Denon thus describes it: "The Kamsin is equally terrible by the frightful spectacle it exhibits when present, and by the consequences which follow its ravages. We had already passed with security one-half of the season in which it usually appears: when, in the evening of the 18th of May, I felt myself entirely overcome by a suffocating heat; it seemed as if the fluctuation of the air was suddenly suspended. I was struck on my arrival with my companions at the bank of the Nile, with a new appearance of nature all around me; this was a

These sands are so fine, and driven with such violence, that they penetrate everywhere, even into chests, be they shut never so closely. If these winds happen to continue for any length of time, they produce epidemic diseases, and are often followed by a great mortality. It is also found to rain but very seldom in that country: however, the want of showers is richly compensated by the copiousness of their dews, which greatly tend to promote vegetation.

In Persia, the winter begins in November, and continues till March. The cold at that time is intense enough to congeal the water; and snow falls in abundance upon their mountains. During the months of March and April, winds arise, that blow with great force, and seem to usher in the heats of summer. These return again, in autumn, with some violence; without, however, producing any dreadful effects. But during their summer, all along the coasts of the Persian gulf, a very dangerous wind prevails, which the natives call the *Sameyel*, still more dreadful and burning than that of Egypt, and attended with instant and fatal effects. This terrible blast, which was, perhaps, the pestilence of the ancients, instantly kills all those that it involves in its passage. What its malignity consists in, none can tell, as none have ever survived its effects, to give information.[10] It frequently, as I am told, assumes a visible form, and darts, in a kind of bluish vapour, along the surface of the country. The natives, not only of Persia, but of Arabia, talk of its effects with terror; and their poets have not failed to heighten them with the assistance of imagination. They have described it as under the conduct of a minister of vengeance, who governs its terrors, and raises or depresses it as he thinks proper.[11] These deadly winds are also known along the coasts of India, at Negapatam, Masulipatam, and Petapoli. But, luckily for mankind, the shortness of their duration diminishes the injuries that might ensue from their malignity.

The Cape of Good Hope, as well as many islands in the West Indies, are famous for their hurricanes, and that extraordinary kind of cloud which is said to produce them. This cloud, which is the forerunner of an approaching hurricane, appears, when first seen, like a small black spot, on the verge of the horizon; and is called by sailors *the bull's eye*, from being seen so minute at a vast distance.[12] All this time a perfect calm reigns over the sea and land, while the cloud grows gradually broader as it approaches. At length, coming to the place where its fury is to fall, it invests the whole horizon with darkness. During all the time of its approach, a hollow murmur is heard in the cavities of the mountains; and beasts and animals, sensible of its approach, are seen running over the fields, to seek for shelter. Nothing can be more terrible than its violence when it begins. The houses in those countries, which are made of timber, the better to resist its fury, bend to the blast like osiers, and again recover their rectitude. The sun, which but a moment before blazed with meridian splendour, is totally shut out; and a midnight darkness prevails, except that the air is incessantly illuminated with gleams of lightning, by which one can easily see to read. The rain falls, at the same time, in torrents; and its descent has been resembled to what pours from the spouts of our houses after a violent shower. These hurricanes are not less offensive to the sense of smelling also, and never come without leaving the most noisome stench behind them.

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kind of light and colours which I had not before seen. The sun, without being concealed, had lost its rays; it had even less lustre to the eye than the moon, and gave a pale light without shade; the waters of the Nile no longer reflected its rays, but appeared in agitation; everything had changed its usual aspect; it was now the flat shore that seemed luminous, and the air dull and opaque; the yellow horizon showed the trees on its surface of a dirty blue; flocks of birds were flying off before the cloud: and frighted animals ran loose in the country, followed by the inhabitants, who vainly attempted to collect them together again. We could now easily conceive the dreadful situation of those who are surprised with such a phenomenon of nature, when crossing the exposed and naked deserts; where, as it stands upon record, many thousands have been overwhelmed and lost in the shoals of sand raised by the Kamsin winds. The next day an astonishing mass of dust, attended with similar appearances, travelled along the desert of Libya: it followed the chain of the mountains, and when we flattered ourselves that we were entirely rid of this pestilence, the west wind brought it back, and once more overwhelmed us with this scorching torrent; the light of the sun could pierce with difficulty through this dense vapour; all the elements appeared to be in disorder; rain was mixed with whirlwinds of fire, wind, and dust, and, in this time of confusion, the trees, and all the other productions of nature, seemed to be again plunged in the horrors of chaos. If the desert of Libya had sent us these clouds of dust, those on the east, on the contrary, had been inundated with water; for the merchants who came from the borders of the Red sea, told us, that in the valleys they had the water up to the middle of their legs. When this destructive scourge sets in from the desert, the inundation of sand overwhelms the country, changes its fertility to barrenness, drives the labourer from his house, whose walls it covers up, and leaves no other mark of vegetable life but the tops of a few palm-trees, which adds still more to the dreary aspect of destruction. Thus the desert is constantly encroaching on the fertile land; and, were the water of the Nile to discontinue its inundations, the whole vale of Egypt would eventually become a desert or bed of sand."—Ed.

[10] It is said of this wind, that if it happens to meet with a shower of rain in its course, and blows across it, it is at once deprived of its noxious quality, and becomes mild and innocent. It is also said, that it was never known to pass the walls of a city. Its fatal effects probably proceed from a certain portion of extremely putrid vapours with which it is charged, by blowing over some very putrid and stagnant lake.

[11] Herbelot, Bibliotheque Oriental.

[12] The water-spout or syphon is a no less dangerous phenomenon. An account of it will be found in the succeeding chapter.

If the seamen also lay by their wet clothes for twenty-four hours, they are all found swarming with little white maggots, that were brought with the hurricane. Our first mariners, when they visited these regions, were ignorant of its effects, and the signs of its approach; their ships, therefore, were dashed to the bottom at the first onset; and numberless were the wrecks which the hurricane occasioned. But at present, being forewarned of its approach, they strip their masts of all their sails, and thus patiently abide its fury. These hurricanes are common in all the tropical climates. On the coasts of Guinea they have frequently three or four in a day, that thus shut out the heavens for a little space; and, when past, leave all again in former splendour. They chiefly prevail, on that coast, in the intervals of the trade-winds; the approach of which clears the air of its meteors, and gives these mortal showers that little degree of wholesomeness which they possess. They chiefly obtain there during the months of April and May; they are known, at Loango, from January to April; on the opposite coast of Africa, the hurricane season begins in May; and, in general, whenever a trade-wind begins to cease, these irregular tempests are found to exert their fury.[13]

All this is terrible; but there is a tempest, known in those climates, more formidable than any we have hitherto been describing, which is called, by the Spaniards, a Tornado. As the former was seen arriving from one part of the heavens, and making a line of destruction; so the winds in this seem to blow from every quarter, and settle upon one destined place, with such fury that nothing can resist their vehemence. When they have all met, in their central spot, then the whirlwind begins with circular rapidity. The sphere every moment widens, as it continues to turn, and catches every object that lies within its attraction. This also, like the former, is preceded by a flattering calm; the air is everywhere hushed, and the sea is as smooth as polished glass: however, as its effects are more dreadful than those of the ordinary hurricane, the mariner tries all the power of his skill to avoid it; which, if he fails of doing, there is the greatest danger of his going to the bottom. All along the coasts of Guinea, beginning about two degrees north of the Line, and so downward, lengthwise, for about a thousand miles, and as many broad, the ocean is unnavigable, on account of these tornadoes. In this torpid region there reigns unceasing tornadoes, or continual calms; among which, whatever ship is so unhappy as to fall, is totally deprived of all power of escaping. In this dreadful repose of all the elements, the solitary vessel is obliged to continue, without a single breeze to assist the mariner's wishes, except those whirlwinds, which only serve to increase his calamity. At present, therefore, this part of the ocean is totally avoided; and, although there may be much gold along the coasts of that part of Africa, to tempt avarice, yet there is something, much more dreadful than the fabled dragon of antiquity, to guard the treasure. As the internal parts of that country are totally unknown to travellers, from their burning sand and extensive deserts; so here we find a vast tract of ocean, lying off its shores, equally unvisited by the mariner.

But of all these terrible tempests that deform the face of nature, and repress human presumption, the sandy tempests of Arabia and Africa are the most terrible, and strike the imagination most strongly. To conceive a proper idea of these, we are by no means to suppose them resembling those whirlwinds of dust that we sometimes see scattering in our air, and sprinkling their contents upon our roads or meadows. The sandstorm of Africa exhibits a very different appearance. As the sand of which the whirlwind is composed is excessively fine, and almost resembles the parts of water, its motion entirely resembles that of a fluid; and the whole plain seems to float onward, like a slow inundation. The body of sand thus rolling, is deep enough to bury houses and palaces in its bosom: travellers who are crossing those extensive deserts perceive its approach at a distance; and in general have time to avoid it, or turn out of its way, as it generally extends but to a moderate breadth. However, when it is extremely rapid, or very extensive, as sometimes is the case, no swiftness, no art, can avail; nothing then remains but to meet death with fortitude, and submit to be buried alive with resignation.[14]

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[13] Lieut.-col. Reid, in a recent work entitled 'An Attempt to Develop the Law of Storms,' seems to have clearly proved that those great storms which so suddenly influence the barometer, and are so disastrous to ships, are great whirlwinds, obeying fixed laws; and that so vast is the diameter of their circuit, that, when they reach high latitudes, they frequently extend over 1,000 miles, and perhaps sometimes over half the width of the Atlantic ocean. The proofs afforded in support of this theory consist of extracts from a number of ships' logbooks, from the reports of the correspondents at Lloyd's, from observations by Colonel Reid's brother-officers, and from various other sources of information. These materials, when arranged for each particular storm to which they refer, form in many cases very interesting narratives; the usual interest which we feel in descriptions of disasters at sea being heightened when we find how the incidents are connected. Colonel Reid observes, that in the works of Horsburgh and other navigators the word 'whirlwind' is constantly used, without any fixed idea being given of the term. He also states that Colonel Capper, of the East India company's service, seems to have been the first to point out that the hurricanes in the bay of Bengal were great whirlwinds, and that Mr. Redfield, of New York, following up the observations of Franklin, has really explained the true nature of the Atlantic storms on the American coast. Most of the storms traced in north latitude were found with a remarkable degree of uniformity to follow courses nearly similar to each other. On examining the charts which accompany the work, we find the storms, whilst still within the tropics, proceeding from the eastward, on a course somewhat to the northward of west, gradually getting further from the equator, and as if going towards the pole. After reaching the 25th or 30th deg. of north latitude, they fall into the general atmospheric current, and then their course is in a north-easterly direction, still continuing further from the equator and nearer to the pole. The sixth chapter of the work on the storms of the southern hemisphere, is thus introduced: "The storm-tracts already traced in north latitude, with few exceptions, are seen to follow nearly similar courses, and in their progress to pass gradually towards the pole. Whilst studying this subject I was led to conclude, that in accordance with the beautiful order and regularity of nature, storms in south latitude would be found to revolve in a precisely contrary direction to that which they take in the northern hemisphere. I therefore earnestly sought for facts to ascertain if this were the case or not." Many instances are given in proof that storms do revolve in the southern hemisphere in a contrary direction tc those of the northern. It is stated, that ships may overtake storms, sailing faster than they move along, and by plunging into them get dismasted, whereas, if the nature of the storm were properly understood, such consequences might be avoided.—Ed.

It is happy for us of Britain that we have no such calamity to fear: for from this even some parts of Europe are not entirely free. We have an account given us in the history of the French Academy, of a miserable town in France, that is constantly in danger of being buried under a similar inundation; with which I will take leave to close this chapter. "In the neighbourhood of St. Paul de Leon, in Lower Brittany,[15] there lies a tract of country along the sea-side, which, before the year 1666, was inhabited, but now lies deserted, by reason of the sands which cover it, to the height of twenty feet; and which every year advance more and more inland, and gain ground continually. From the time mentioned above, the sand has buried more than six leagues of the country inward; and it is now but half a league from the town of St. Paul: so that, in all appearance, the inhabitants must be obliged to abandon it entirely. In the country that has been overwhelmed, there are still to be seen the tops of some steeples peeping through the sand, and many chimneys that still remain above this sandy ocean. The inhabitants, however, had sufficient time to escape; but being deprived of their little all, they had no other resource but begging for their subsistence. This calamity chiefly owes its advancement to a north or an east wind, raising the sand, which is extremely fine, in such great quantities, and with such velocity, that M. Deslands, who gave the account, says, that while he was walking near the place, during a moderate breeze of wind, he was obliged, from time to time, to shake the sand from his clothes and his hat, on which it was lodged in great quantities, and made them too heavy to be easily borne. Still further, when the wind was violent it drove the sand across a little arm of the sea, into the town of Roscoff, and covered the streets of that place two feet deep; so that they have been obliged to carry it off in carts. It may also be observed, that there are several particles of iron mixed with the sand, which are readily affected by the loadstone. The part of the coast that furnishes these sands is a tract of about four leagues in length, and is upon a level with the sea at high-water. The shore lies in such a manner as to leave its sands subject only to the north and east winds, that bear them farther up the shore. It is easy to conceive how the same sand that has at one time been borne a short way inland, may by some succeeding and stronger blast be carried up much higher; and thus the whole may continue advancing forward, deluging the plain, and totally destroying its fertility. At the same time, the sea, from whence this deluge of sand proceeds, may furnish it in inexhaustible quantities. This unhappy country, thus overwhelmed in so singular a manner, may well justify what the ancients and the moderns have reported concerning those tempests of sand in Africa, that are said to destroy villages, and even armies in their bosom."[16]

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[14] See Supplementary Note C, p. 170.

[15] Histoire de l'Academie des Sciences, an. 1722.

[16] In Sicily a wind is known by the name of the *Sirocco*, so called because it is supposed to blow from Syria. Its medium heat is calculated at 112 degrees: it is fatal to vegetation, and destructive to mankind, and especially to strangers; it depresses the spirits in an unusual degree; it suspends the powers of digestion, so that those who venture to eat a heavy supper, while this wind prevails, are commonly found dead in their beds the next morning, of what is called an indigestion. The sick at that afflicting period commonly sink under the pressure of their diseases; and it is customary in the morning, after this wind has continued a whole night, to inquire who is dead.—Ed.

Note A.—*Theory of Trade-winds.*

Captain Basil Hall, in a letter to Mr. J. F. Daniell, has entered largely into the history and theory of trade-winds. "The north-east trade-wind," he says, "is conceived to blow from the exact north-east point, nearly to the equator, when it takes a graceful bend, and blows more and more from the east point, till at length it becomes parallel to it; that is, blows from due east. The south-east trade-wind in like manner, is supposed to blow at first precisely at south-east, or at an angle of 45° with the meridian, and at last to assume an exact parallelism with the equinoctial line. This, however, is altogether erroneous. The real state of things is as follows.

The trade-winds in the Atlantic and Pacific ocean extend to about twenty-eight degrees of latitude on each side of the equator,—sometimes a degree or two farther; so that a ship, after passing the latitude of thirty degrees, may expect every day to enter them. It will perhaps assist the apprehension of the subject to suppose ourselves actually making a voyage to the Cape, first outwards, and then homewards; by which means we shall have to cross each of these winds twice. Shortly after leaving Madeira, which is 32$\frac{1}{4}$°, we get into 'the Trades,' and instead of finding the wind blowing from north-east—as the accounts would lead us to suppose—we shall find it blowing from east, or even sometimes a little southerly. You are seaman enough to be aware that, with the wind at east, a south course can readily be steered, first towards the Canaries, and then to the Cape de Verde islands. It is the most approved practice, I think, to pass just within sight of these islands to the westward of them; that is to say, leaving them on the left hand. As the ship advances to the southward, she finds the trade-wind drawing round gradually from east to north-east, and finally to north-north-east; and even north at the southern verge of the north-east trade. The last-named or northern direction, it will be observed, is at right angles to that usually assigned to it—due east, near the line. The southern limit to the north-east trade-wind varies with the season of the year, reaching at one time to within three or four degrees of north latitude, and at other times not approaching it nearer than ten or twelve degrees; but it never crosses the equator and enters the southern latitudes. It will aid the memory in this matter, to bear in mind that the line, which limits or marks the termination of this trade-wind, follows the sun. In July and August it recedes from the equator, in pursuit, as it were, of the sun; while in December and January, when the sun has high southern declination, it reaches almost to the line.

The great difficulty of the outward-bound voyage commences after the ship is deserted by the north-east trade, as she has then to fight across a considerable range of calms, and of what are called 'the variables,' where the wind has generally more or less southing in it. At certain seasons it blows freshly from the south-south-west, and greatly perplexes the young navigator, who, from trusting to published accounts, expects to find the wind, not from south, but from east. This troublesome range varies in width from 150 to 550 miles; is widest in September, and narrowest in December or January. I speak now of what takes place in the Atlantic; for it is not quite the same far at sea in the Pacific ocean, where fewer modifying circumstances interfere with the regular course of the phenomena, than in the comparatively narrow neck formed by the protuberances of Africa and South America.

I may remark in passing, that it is upon a knowledge of these deviations from the general rule, which we are pleased to call *irregularities*, that much of the success of tropical navigation depends. A seaman who trusts to theory alone, will, in all probability, make a bad passage; while another, who relies solely upon past experience, will probably, if the season happens to be different, do quite as badly. The judicious navigator will endeavour to unite the two; and having attentively studied the theory of his subject, and sought to reduce every case to its principles, checking these from time to time by fresh experience, may be able, when occasions arrive where his own knowledge or that of others entirely fails him, to take that course which, all things considered, is most likely to serve the purpose he has in view.

But I am forgetting our voyager. We had reached that spot where the north-east trade-wind left us rolling in a dead calm, or with only an occasional violent squall, accompanied by deluges of rain, in a climate so hot that the slightest cat's paw of wind is hailed with the utmost delight. In process of time, the ship, by taking advantage of every such puff of wind, gets across this troublesome stage of her journey, and meets the south-east trade. It is very material to remark, that this wind does not blow from the east, as the navigator is led to expect, or in a direction parallel to the equator, and which would be to him a fair wind; but it meets him, as it is emphatically termed, *smack in the teeth*. Instead, therefore, of steering away south, or south-south-east for the Cape of Good Hope, he is obliged to keep his wind as closely as possible, and he may think himself fortunate, in a dull sailer, if he can clear the coast of Brazil without making a tack. As he proceeds on, however, the wind gradually hauls to the south-eastward, then to east-south-east, and at last east, at the southern limit of the trade-winds properly so called. Here, after a little baffling weather, he is almost certain of finding westerly winds, which prevail in the latitudes beyond 'the trades' in both hemispheres.

Such are the phenomena most generally observed with respect to the regular trade-winds outward bound. We shall now, in order to make things quite clear, invert the order of the voyage, and suppose the ship, after having reached the Cape of Good Hope, to turn back again. At first she may be plagued with westerly and north-westerly winds; but she will generally be able to stretch into 'the trades,' where she will at first find the wind hanging far to the east, and it may even have some northing in it at first. As she proceeds onwards to St. Helena, which lies directly in the tract of homeward-bound ships, the wind will draw to the east,—east-south-east,—south-east,—and, eventually, to south-south-east. At crossing the equator, it will probably be blowing from due south, and not—I must again beg you to take particular notice—from due east, as we are generally led to suppose. After reaching three or four degrees of north latitude, the ship will lose the south-east trade, and re-enter 'the variables,' where, when it is not calm, she will generally find light southerly winds, and, at one period of the year, namely, about July and August, blowing briskly from the south-west, as far as ten or twelve degrees of north latitude. At other seasons, especially when the sun is near the line, a ship may expect light winds from all quarters of the compass, long calms, and now and then a furious squall, with deluges of rain. But at every season of the year, the homeward-bound passage, or that from the southward, is much easier made than the reverse.

On reaching the southern limit of the north-east trade-wind, the seaman finds the wind blowing in his face from the north, (exactly as he formerly met the south-east trade, blowing not from east, but from the south pole,) and is obliged to stretch away to the west-north-west at first, and then north-west, as if he were going to the United States of America —not to Europe. As he sails on, and gets more into 'the trade,' it draws round gradually to north-east, and east-north-east, which allows of his 'coming up' more and more every day, till at length he can steer north—and even north-east; so that he is enabled frequently to 'look up' for the Azores or Western islands. By-and-by he bids adieu to the north-east trade, in about twenty-eight or twenty-nine degrees of north latitude, as he formerly did of the other trade, in the correspondent degree south. In like manner, also, he will now almost always meet with westerly winds, which will carry him to the channel. It may be remarked by the way, that these westerly winds are not so regular as they are in the southern hemisphere, owing probably to the comparative absence of land, which enables the general principle, by which the winds are produced to act there with greater uniformity.

If these descriptions have been rendered sufficiently intelligible to a person who has not before considered the subject, I think he will be in a situation to comprehend the theory: and when that is duly fixed in his imagination, he will find it useful to go back again to the facts stated above, with sharper powers of observation, and a judgment more fitted to arrange and generalize these materials to good purpose.

If air, at any particular spot, be heated, it becomes specifically lighter than the adjacent cooler parts, and consequently rises; while its place is speedily occupied by the contiguous less rarefied or colder air. Now, the region of the globe lying between the tropics, or, we may say, between thirty degrees on each side of the equator, being exposed to the most direct rays of the sun, becomes heated; and the air in contact with this belt, or zone, becoming rarefied, rises with more or less rapidity, according to the circumstances under which the earth is situated. Where an open ocean is found, the incumbent air will be less heated, as in the Pacific, than where districts of dry earth are found, as in Mexico for instance. The partial vacuum thus formed will, in both hemispheres, be supplied by the adjacent air lying, we shall suppose, between the latitudes of thirty and fifty degrees. If this be admitted, most of the phenomena of the trade-winds* will, I conceive, be readily explained. It must be granted, however, before proceeding farther, that a volume of air put into motion, is like every other body, possessed with a momentum, which will continue that motion till stopped by its friction against the fluid through which it is propelled, or by that of the surface of a solid body along which it may be impelled. Any one who has observed the ring of smoke sometimes projected from the mouth of a cannon will understand this; or the familiar experiment of blowing out a candle by means of the air forced from an uncharged gun, by means of one of the copper priming-caps, affords ample illustration that a mass of air once put in motion, will retain that motion like any other portion of matter.

The velocity of the earth's rotation at the equator is, in round numbers, 1,000 miles an hour; at latitude 30° it is about 860, or about 140 miles an hour slower. The average velocity of the earth's easterly motion, in the space between the equator and latitude 30°, may be stated at 950 miles an hour; while that of the belt lying between thirty and forty degrees, is not much above 800 miles an hour.

The superincumbent air at these places respectively, *supposing no difference of temperature to exist*, would of course partake of the earth's velocity, and there would be an universal calm. But, if we suppose the tropical region to be heated, the air over it will instantly ascend, and take its station above the cold; while the colder and more dense air lying beyond the tropics, will rush in to occupy its place, below that which has been heated. This hardly needs illustration; but, as I have more than once met with people who did not immediately see the consequences which follow from placing two fluids of different density side by side, I may suggest the experiment of a trough, divided, by a sluice in the centre, into two spaces, one of which may be filled with water, the other with quicksilver: both fluids will of course be at rest until the sluice be drawn up, when the heavier fluid will immediately rush in beneath the lighter, and the lighter will flow along above the quicksilver. If, instead of these fluids we substitute hot and cold water the same thing will take place, the cold always flowing under the hot, towards the place formerly occupied by the lower strata of the heated fluid; while the heated portion flows along over the cold, towards the place formerly occupied by the upper strata of the cold fluid. Exactly the same thing will take place if two portions of air, at different temperatures, be the contiguous fluids; though the phenomena will not now strike the senses so strongly.

It would not be difficult, I conceive, to have a globe fitted with a contrivance which should represent the operation of the trade-winds; and perhaps a description of such an apparatus will be as ready a method as any other of explaining my views of this theory. Having taken a common globe, I would enclose its tropical region from thirty degrees north to thirty degrees south, in a glass zone or coating concentric with the globe, and also each of the belts lying between the latitudes of thirty and fifty degrees in like manner, with distinct cases placed respectively in close contact with the tropical glass coating, and divided from it by partitions removeable at pleasure; I would fill the tropical case with hot water, and the middle latitude cases, or those embracing the space contained between the latitudes of thirty and fifty degrees in both hemispheres, with cold water; or, which would represent the actual fact still better, a broad ring of heated iron might be fixed round the equator to represent the torrid zone, while the middle or temperate latitudes both north and south, should be encircled with rings of ice. The water might also be coloured in order to render the effect visible. Things being arranged as above described, and the globe being supposed *for the present* at rest, if the division between the hot and the cold fluids were removed, the cold water would gradually slide along *under* the hot towards the equator, while the heated water would be carried *over* the cold towards the poles; and, if nothing else were done, that is to say, if the globe were allowed to remain at rest, a mere circular interchange would take place. The temperate portions of the fluid, on coming into contact with the torrid zone of the globe, and being thereby heated and rendered specifically lighter, would necessarily rise; while the hot portion, on flowing towards the cooling substance in latitudes farther from the equator, would descend to occupy the place of the cold water drawn off to supply the place of the lighter heated water at the equator. A steady current would in this way be produced, running below towards the equator, and at right angles to it, and above towards the poles: this would evidently be the only motion impressed on the fluid as long as the globe stood still.

It is material to remark here, that this motion would be less and less obvious as the currents approached the equator, where the cold fluid would gradually become heated, and have a tendency to rise as well as to flow along, so that their course would be checked, till at length, at the equator, the opposite currents would meet and produce a calm.

While things are supposed to be in this situation, let the globe be put into rapid motion from west to east, we shall say, for the sake of illustration, at the rate of one thousand feet in a minute, while all the circumstances as to temperature remain as before. The cold water would continue to flow just as before, under the hot, towards the equator, where the rarefying cause existed, but it would now come to the equatorial regions, possessed, not only with a motion directly towards the equator, but with the easterly velocity due to that circle of latitude which it had left, or about eight hundred feet in a minute; and if we suppose these equatorial regions to be moving to the eastward at the average rate of nine hundred and fifty feet in the same interval, the cold water moving at the slower rate would inevitably at its first arrival there be left behind; or, which is the same thing, the surface of the globe would go faster to the eastward than the superincumbent water, and this, in effect, would produce an apparent or relative motion of the water from east to west; or, if the fluid in question were air, we should there have what we call an easterly wind.

This, in its most general sense, is what really takes place with the trade-winds, and if what I have said be well understood, all the modifications which they undergo will be readily seen to follow. The cold air, however, (it must be carefully observed,) which comes towards the equator, is acted upon by two forces, or, in other words, is influenced by two sources of motion: first, by that which has been impressed upon it in a due easterly direction, by the rotation of the earth in the temperate latitudes it has left: and, secondly, by a motion in the direction of the meridian, towards the equator, and at right angles to it. This last is caused by the air rushing in to fill up the space left by that which has been rarefied by the heat of the torrid zone, as shown in the first experiment where the globe stood still; in which case, it will be remembered, this was the only motion to which the fluid was exposed. The combined effect of these two motions is to produce the south-east trade-wind in south latitude, and the north-east trade on the other side of the equator.

When the comparatively slow-moving air of the temperate zone, caused by the rotatory motion of the earth to the east, first comes into contact with the quick moving or tropical belt of the globe, the difference of their velocities is great compared with the other motion of the air above described, or that directly towards the equator; and consequently the wind blows at the extreme edge of the trades nearly from the east point. As this cool air, however, is drawn nearer to the equator, and comes successively in contact with parallels of latitude moving faster and faster, this constant action of the earth's rapid easterly motion gradually imparts to the superincumbent air the rotatory velocity due to the equatorial regions which it has now reached; that is to say, there will be less and less difference at every moment between the easterly motion of the earth and the easterly motion of the air in question; while, at the same time, the other motion of the same air, or that which has a tendency to carry it straight towards the equator, having been exposed merely to the friction along the surface without meeting any such powerful counteracting influence as the earth's rotation, will remain nearly unchecked in its velocity. Thus, as I conceive, the trade-wind must gradually lose the eastern character which it had on first quitting the temperate for the tropical region, in consequence of its acquiring more and more that of the rotatory motion of the earth due to the equatorial regions it has now reached. While this cause operates, therefore, to destroy the easterly direction of the trades, their meridional motion, as it may be called, or that towards the equator, by remaining constant or nearly so, will become more and more apparent, till at length, when the friction of the earth in its rotatory motion has reduced the velocity of the cool air to the tropical rate, there will be left only this motion towards the equator, which is found invariably to characterize the equatorial limits of both trade-winds. This velocity, also, is at length checked, first, by its friction on the surface of the earth: secondly, by the air becoming heated, which causes it rather to rise than to flow along the surface: and thirdly, by the meeting of the two opposite currents—one from the north, the other from the south."

NOTE B.—*Monsoons.*

The term *Monsoon* is otherwise derived from *moussin*, a Malay word, signifying "season." It is in the Indian ocean alone that the famous monsoons, or half-yearly winds, seem to destroy the uniformity of the general atmospheric movement. No doubt, however, they might be made to accord with it, provided we knew all the circumstances which influence them. We exhibit the facts in the first place. From the 10th degree of south latitude to the tropic of Capricorn, and beyond it, the general east or south-east trade-wind prevails over all the Indian ocean, sometimes in summer extending as far as the 2d and 3d degrees of south latitude. On this side the 10th degree, we first meet with the monsoons or periodical half-yearly winds. North of the equator, from April to October, a violent south-west wind prevails, accompanied with tempests, storms, and rain; while a soft and pleasant north-east wind blows during the other six months. Between the second and twelfth parallels of south latitude, the winds blow generally from north-west during the winter six months, from south-west in summer.

During winter, then, the constitution of the atmosphere exhibits the following principal circumstances: north-east winds north of the line; north-west winds south of it, to the 10th parallel; and finally, the east and south-east trade-winds. In summer, the phenomena are less contradictory: south-west winds from the 10th parallel to the northern limits; trade-winds south of the 10th parallel.

These general tendencies are subject to variations, depending on the figure and elevation of coasts, on straits, and currents of the sea. The north-west and south-west monsoons are weaker and more variable in the bay of Bengal, more steady and violent in the gulf of Arabia. Both those monsoons grow broader to the west, ranging in this direction over the whole tract of sea that lies between Africa and Madagascar. In the seas extending between China, the kingdom of Siam, Sumatra, and the equator, those monsoons are felt likewise; but here, excepting local variations, they are almost entirely north and south. They extend as far as the Philippine islands, and though with much inconstancy, even to Japan. Between the equator, the islands of Java, and New Guinea, the monsoons are nearly similar to those of the Chinese sea, in regard to their direction, which merely varies a little to the north-west in the north monsoon, and a little to the south-west in the south monsoon. But they do not begin till six weeks after those of the Chinese seas.

Some other striking circumstances still remain to be noticed. The monsoons do not change, or, as sailors express it, do not break, of a sudden. Their change, which usually takes place fifteen days or four weeks after the equinoxes, is announced by the decay of the existing monsoon, by calms and squalls in rapid succession, by storms, water-spouts, tornadoes, and by Indian hurricanes, called *taifouns, or typhons*, particularly terrible from the explosions of electric matter accumulated by the monsoon. The beginnings of the subsequent monsoon are, at first, liable to variations, till finally it establishes an absolute dominion.

Navigators assert, that on quitting the region where a monsoon prevails, one is sure, in ordinary circumstances, to fall in with a very strong and impetuous wind, blowing from a quarter directly opposite. They must naturally have observed this phenomenon with much care, since the calms and whirlwinds it occasions are productive of great danger. It can hardly be explained, except by admitting, with Halley, the existence of two currents,—one above, composed of warm and rarefied air; another below, composed of the column of cold and condensed air. This hypothesis will become almost a settled truth, if we observe how small is the elevation to which the monsoon extends—a fact clearly exhibited in the peninsula on this side the Ganges, where the monsoons are arrested for several months by the mountain chain of the Gauts (not certainly of extraordinary height); so that the coast of Coromandel, and that of Malabar, have always their dry and their rainy seasons, at opposite periods of the year. According to the preceding description, it is the south-west monsoon alone which presents any phenomena directly contrary to the general movement of the atmosphere; for the north-east monsoon is in conformity with it, and the north-west wind south of the line seems not to be altogether constant, and may perhaps arise from nothing more than a compound movement, or a higher current of air. What, then, is the origin of this half-yearly wind, which in summer blows from south and south-west, over all the Indian ocean? The sagacity of physical geographers has long been exercised by this question. We give the explanation of which Halley laid the ground-work, and which appears to us the most plausible.

The monsoons always change some time after the equinoxes; they constantly blow towards that hemisphere in which the sun is found. The action of this luminary on the atmosphere, is, therefore, plainly one of their causes. When its rays, reflected from the mountains of Thibet, scorching the plains of Bengal, and the valleys of the kingdom of Siam, rarefy and dissipate the atmosphere, the cold air becomes violently attracted from the regions about the south pole. The sun's action is seconded by the marine current, which proceeds from the south polar seas to those of India. This current must bring with it a column of vapours, continually disengaging themselves from its surface. The absence of a northern marine current must farther be added; we can even imagine, that the mountains of Thibet, and the whole central platform of Asia, may arrest and preserve the cold air, which would otherwise proceed from Siberia towards India.

But why does not this polar wind prevail south of the equator also? For the same reason which renders the aquatic polar current inconsiderable there. The general movement of the ocean being opposed by no obstacle, has too much force to be modified by the polar current. A similar result happens in the atmosphere, at all times intimately connected with the ocean, which feeds and modifies it. But on leaving New Holland between us and the Pacific ocean, the general movement of the Indian sea must evidently be more and more abandoned to its individual force, and that force must soon be overcome by the polar current, which, after being long deflected or concealed by the general movement of the ocean, now re-appears in all its energy. The polar column of water now fills the atmosphere with cold particles, which, by their gravity, determine the whole atmospheric mass to flow towards the equator, more strongly and more directly than it would have flowed otherwise. It is possible, moreover, that higher currents may exist in the atmosphere, and descend towards the earth at the time when the monsoons commence.

NOTE C.—*Sand-storm in the Desert.*

In his travels to discover the source of the Nile, Mr. Bruce observed the astonishing phenomenon of moving pillars of sand, which are probably the effects of a number of whirlwinds in those torrid regions. In relating the particulars of his journey across a part of the deserts of Africa, he observes, "We were here at once surprised and terrified with a sight surely one of the most magnificent in the world. In that vast expanse of desert, from west and to the north-west of us, we saw a number of prodigious pillars of sand at different distances, at times moving with great celerity, and at others stalking on with a majestic slowness; at intervals we thought they were coming in a very few minutes to overwhelm us: and small quantities of sand did actually more than once reach us. Again they would retreat so as to be almost out of sight, their tops reaching to the very clouds. There the tops often separated from the bodies, and these once disjoined, dispersed in the air, and did not appear more. Sometimes they were broken near the middle, as if struck with a large cannon shot: about noon they began to advance with considerable swiftness upon us, the wind being very strong at north. Eleven of them ranged alongside of us, about the distance of three miles. The greatest diameter of the largest appeared to me at that distance as if it would measure ten feet. They retired from us with a wind at south-east, leaving an impression upon my mind to which I can give no name, though surely one ingredient in it was fear, with a considerable deal of wonder and astonishment. It was in vain to think of flying; the swiftest horse, or fastest sailing ship could be of no use to carry us out of this danger; and the full persuasion of this rivetted me as if to the spot where I stood, and let the camels gain on me so much in my state of lameness, that it was with some difficulty I could overtake them. The same phenomenon occurred again in the course of a few days. The same appearance of moving pillars of sand presented themselves to us this day, in form and disposition like those we had seen at Waadi Halboub, only they seemed to be more in number and less in size. They came several times in a direction close upon us: that is, I believe within less than two miles. They began immediately after sun-rise like a thick wood, and almost darkened the sun; his rays shining through them for near an hour, gave them an appearance of pillars of fire. Our people now became desperate, the Greeks shrieked out, and said it was the day of judgment. Ismael pronounced it to be hell, and the Tucorories that the world was on fire. I asked Idris if ever he had before seen such a sight? He said he had often seen them as terrible, though never worse; but what he feared most was the extreme redness of the air, which was a sure presage of the coming of the simoom. I begged and entreated Idris that he would not say one word of that in the hearing of the people, for they had already felt it at Imhansara, on their way from Ras el Feel to Teawa, and again at the Acaba of Gerri, before we came to Chendi, and they were already nearly distracted at the apprehension of finding it here. On the 16th, at half-past ten in the forenoon, we left El Mout, standing in the direction close upon Syene. At eleven o'clock, while we contemplated with pleasure the rugged top of Chiggne, to which we were fast approaching, and where we were to solace ourselves with plenty of good water, Idris cried out with a loud voice, 'Fall upon your faces, for here is the simoom.' I saw from the south-east a haze come, in colour like the purple part of the rainbow, but not so compressed or thick. It did not occupy twenty yards in breadth, and was about twelve feet high from the ground. It was a kind of blush upon the air, and it moved very rapidly, for I scarce could turn to fall upon the ground with my head to the northward, when I felt the heat of its current plainly upon my face. We all lay flat upon the ground, till Idris told us it was blown over. The meteor or purple haze which I saw, was indeed past, but the light air that still blew was of heat to threaten suffocation. For my part, I found distinctly in my breast that I had imbibed a part of it; nor was I free of an asthmatic sensation till I had been some months in Italy, at the baths of Poretta, near two years afterwards."

CHAP. XXI.

OF METEORS AND SUCH APPEARANCES AS RESULT FROM A COMBINATION OF THE ELEMENTS.

IN proportion as the substances of nature are more compounded and combined, their appearances become more inexplicable and amazing. The properties of water have been very nearly ascertained. Many of the qualities of air, earth, and fire, have been discovered and estimated; but when these come to be united by nature, they often produce a result which no artificial combinations can imitate; and we stand surprised, that although we are possessed of all those substances which nature makes use of, she shows herself a much more various operator than the most skilful chemist ever appeared to be. Every cloud that moves, and every shower that falls, serves to mortify the philosopher's pride, and to show him hidden qualities in air and water, that he finds it difficult to explain. Dews, hail, snow, and thunder, are not less difficult for being more common. Indeed, when we reflect on the manner in which nature performs any one of these operations, our wonder increases. To see water, which is heavier than air, rising in air, and then falling in a form so very different from that in which it rose; to see the same fluid at one time descending in the form of hail, at another in that of snow; to see two clouds, by dashing against each other, producing an electrical fire, which no watery composition that we know of can effect; these, I say, serve sufficiently to excite our wonder; and still the more in proportion as the objects are ever pressing on our curiosity. Much, however, has been written concerning the manner in which nature operates in these productions; as nothing is so ungrateful to mankind as hopeless ignorance.

And first, with regard to the manner in which water evaporates, and rises to form clouds, much has been advanced, and many theories devised.[1] All water,[2] say some, has a quantity of air mixed with it; and the heat of the sun, darting down, disengages the particles of this air from the grosser fluid; the sun's rays being reflected back from the water, carry back with them those bubbles of air and water, which, being lighter than the condensed air, will ascend till they meet with a more rarefied air; and they will then stand suspended. Experience, however, proves nothing of all this. Particles of air or fire are not thus known to ascend with a thin coat of water; and, in fact, we know that the little particles of steam are solid drops of water. But, besides this, water is known to evaporate more powerfully in the severest frost, than when the air is moderately warm.[3] Dr. Hamilton, therefore, of the university of Dublin, rejecting this theory, has endeavoured to establish another. According to him, as aqua fortis is a menstruum that dissolves iron, and keeps it mixed in the fluid; as aqua regia is a menstruum that dissolves gold; or as water dissolves salts to a certain quantity, so air is a menstruum that corrodes and dissolves a certain quantity of water, and keeps it suspended above. But however ingenious this may be, it can hardly be admitted; as we know by Mariotte's experiment,[4] that if water and air be enclosed together, instead of the air's acting as a menstruum upon the water, the water will act as a menstruum upon the air, and take it all up. We know also, that of two bodies, that which is most fluid and penetrating is most likely to be the menstruum of the other; but water is more fluid and penetrating than air, and therefore the most likely of the two to be the menstruum. We know that all bodies are more speedily acted upon, the more their parts are brought into contact with the menstruum that dissolves them; but water enclosed with compressed air, is not the more diminished thereby.[5] In short, we know, that cold, which diminishes the force of other menstruums, is often found to promote evaporation. In this variety of opinion and uncertainty of conjecture, I cannot help thinking that a theory of evaporation may be formed upon very simple and obvious principles, and embarrassed, as far as I can conceive, with very few objections.

We know that a repelling power prevails in nature, not less than an attractive one. This repulsion prevails strongly between the body of fire and that of water. If I plunge the end of a red-hot bar of iron into a vessel of water, the fluid rises, and large drops of it fly up in all manner of directions, every part bubbling and steaming until the iron be cold. Why may we not for a moment compare the rays of the sun, darted directly upon the surface of the water, to so many bars of red-hot iron, each bar indeed infinitely small, but not the less powerful? In this case, wherever a ray of fire darts, the water, from its repulsive quality, will be driven on all sides; and, of consequence, as in the case of the bar of iron, a part of it will rise. The parts thus rising, however, will be extremely small; as the ray that darts is extremely so. The assemblage of the rays darting upon the water in this manner, will cause it to rise in a light thin steam above the surface; and as the parts of the steam are extremely minute, they will be lighter than air, and consequently float upon it. There is no need for supposing them bubbles of water filled with fire; for any substance, even gold itself, will float on air, if its parts be made small enough; or, in other words, if its surface be sufficiently increased. This water, thus disengaged from the general mass, will be still farther attenuated and broken by the reflected rays, and consequently, more adapted for ascending.

From this plain account, every appearance in evaporation may be easily deduced. The quantity of heat increases evaporation, because it raises a greater quantity of steam. The quantity of wind increases evaporation; for, by waving the surface of the water, it thus exposes a greater surface to the evaporating rays. A dry frost, in some measure, assists the quantity of evaporation; as the quantity of rays are found to be no way diminished thereby. Moist weather alone prevents evaporation; for the rays being absorbed, refracted, and broken, by the intervening moisture, before they arrive at the surface, cannot produce the effect; and the vapour will rise in a small proportion.

Thus far we have accounted for the ascent of vapours; but to account for their falling again is attended with rather more difficulty. We have already observed, that the particles of vapour, disengaged from the surface of the water, will be broken and attenuated in their ascent, by the reflected, and even the direct rays, that happen to strike upon their minute surfaces. They will, therefore, continue to ascend, till they rise above the operation of the reflected rays, which reaches but to a certain height above the surface of the earth. Being arrived at this region, which is cold for want of reflected heat, they will be condensed, and suspended in the form of clouds. Some vapours that ascend to great heights, will be frozen into snow; others, that are condensed lower down, will put on the appearance of a mist, which we find the clouds to be, when we ascend among them, as they hang along the sides of a mountain. These clouds of snow and rain, being blown about by winds, are either entirely scattered and dispersed above, or they are still more condensed by motion, like a snow-ball, that grows more large and solid as it continues to roll. At last, therefore, they will become too weighty for the air which first raised them to sustain; and they will descend with their excesses of weight, either in snow or rain. But as they will fall precipitately, when they begin to descend, the air, in some measure, will resist the falling; for as the descending fluid gathers velocity in its precipitation, the air will increase its resistance to it, and the water will, therefore, be thus broken into rain; as we see, that water which falls from the tops of houses, though it begins in a spout, separates into drops before it has got to the bottom. Were it not for this happy interposition of the air, between us and the water falling from a considerable height above us, a drop of rain might fall with dangerous force, and a hailstone might strike us with fatal rapidity.

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[1] See Note upon Evaporation, at page 126.

[2] Spectacle de la Nature, vol. iii.

[3] Memoires de l'Academie des Sciences, an. 1705.

[4] Mariotte, de la Nature de l'Air, pp. 97, 106.

[5] See Boyle's Works, vol. ii. p. 619.

In this manner evaporation is produced by day; but when the sun goes down, a part of that vapour which his rays had excited, being no longer broken and attenuated by the reflecting rays, it will become heavier than the air, even before it has reached the clouds; and it will, therefore, fall back in dews,[6] which differ only from rain in descending before they have had time to condense into a visible form. Hail, the Cartesians say, is a frozen cloud, half melted, and frozen again in its descent. A hoar-frost is but a frozen dew. Lightning we know to be an electrical flash, produced by the opposition of two clouds; and thunder to be the sound proceeding from the same, continued by an echo reverberated among them. It would be to very little purpose to attempt explaining exactly how these wonders are effected; we have as yet little insight into the manner in which these meteors are found to operate upon each other; and, therefore, we must be contented with a detail rather of their effects than their causes.

In our own gentle climate, where nature wears the mildest and kindest aspect, every meteor seems to befriend us. With us, rains fall in refreshing showers, to enliven our fields, and to paint the landscape with a more vivid beauty. Snows cover the earth, to preserve its tender vegetables from the inclemency of the departing winter. The dews descend with such an imperceptible fall as no way injures the constitution. Even thunder is seldom injurious; and it is often wished-for by the husbandman to clear the air, and to kill the numberless insects that are noxious to vegetation. Hail is the most injurious meteor that is known in our climate; but it seldom visits us with violence, and then its fury is but transient.

One of the most dreadful storms we hear of,[7] was that of Hertfordshire, in the year 1697. It began by thunder and lightning, which continued for some hours, when suddenly a black cloud came forward, against the wind, and marked its passage with devastation. The hailstones which it poured down, being measured, were found to be many of them fourteen inches round, and consequently as large as a bowling-green ball. Wherever it came, every plantation fell before it; it tore up the ground, split great oaks, and other trees, without number; the fields of rye were cut down, as if levelled with a scythe; wheat, oats, and barley, suffered the same damage. The inhabitants found but a precarious shelter, even in their houses, their tiles and windows being broke by the violence of the hailstones, which, by the force with which they came, seemed to have descended from a great height. The birds, in this universal wreck, vainly tried to escape by flight; pigeons, crows, rooks, and many more of the smaller and feebler kinds were brought down. An unhappy young man, who had not time to take shelter, was killed; one of his eyes was struck out of his head, and his body was all over black with bruises; another had just time to escape, but not without the most imminent danger, his body being bruised all over. But what is most extraordinary, all this fell within the compass of a mile.

Mezeray, in his History of France, tells us of a shower of hail much more terrible, which happened in the year 1510, when the French monarch invaded Italy. There was, for a time, a horrid darkness, thicker than that of midnight, which continued till the terrors of mankind were changed to still more terrible objects, by thunder and lightning breaking the gloom, and bringing on such a shower of hail, as no history of human calamities could equal. These hailstones were of a bluish colour; and some of them weighed not less than a hundred pounds. A noisome vapour of sulphur attended the storm. All the birds and beasts of the country were entirely destroyed. Numbers of the human race suffered the same fate. But what is still more extraordinary, the fishes found no protection from their native element; but were equal sufferers in the general calamity.

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[6] It has been observed with surprise, that when a number of bodies are exposed together to dew, some are quite wetted with it, while others remain dry. This circumstance probably depends upon the goodness of the body as a conductor of heat. Good conductors will part with their heat more readily, and will therefore evaporate the dew again, whereas it will remain upon bad conductors, which will not so easily part with their heat. If this explanation be the true one, it follows that bodies exposed to the dew, and dry, must have a lower temperature than those which remain moist.—ED.

[7] Phil. Trans. vol. ii. p. 148.

These, however, are terrors that are seldom exerted in our mild climates. They only serve to mark the page of history with wonder; and stand as admonitions to mankind, of the various stores of punishment, in the hands of the Deity, which his power can treasure up, and his mercy can suspend.

In the temperate zones, therefore, meteors are rarely found thus terrible; but between the tropics, and near the poles, they assume very dreadful and various appearances. In those inclement regions, where cold and heat exert their chief power, meteors seem peculiarly to have fixed their residence. They are seen there in a thousand terrifying forms, astonishing to Europeans, yet disregarded by the natives, from their frequency. The wonders of air, fire, and water, are there combined, to produce the most tremendous effects; and to sport with the labours and apprehensions of mankind. Lightnings, that flash without noise; hurricanes, that tear up the earth; clouds, that all at once pour down their contents, and produce an instant deluge; mock suns; northern lights, that illuminate half the hemisphere; circular rainbows; halos; fleeting balls of fire; clouds reflecting back the images of things on earth, like mirrors; and water-spouts, that burst from the sea, to join with the mists that hang immediately above them. These are but a part of the phenomena that are common in those countries; and from many of which our own climate is, in a great measure, exempted.

The meteors of the torrid zone are different from those that are found near the polar circles; and it may readily be supposed, that in those countries where the sun exerts the greatest force in raising vapours of all kinds, there should be the greatest quantity of meteors. Upon the approach of the winter months, as they are called under the Line, which usually begin about May, the sky, from a fiery brightness, begins to be overcast, and the whole horizon seems wrapt in a muddy cloud. Mists and vapours still continue to rise; and the air, which so lately before was clear and elastic, now becomes humid, obscure, and stifling; the fogs become so thick, that the light of the sun seems in a manner excluded; nor would its presence be known but for the intense and suffocating heat of its beams, which dart through the gloom, and instead of dissipating only serve to increase the mist. After this preparation, there follows an almost continual succession of thunder, rain, and tempests. During this dreadful season, the streets of cities flow like rivers; and the whole country wears the appearance of an ocean. The inhabitants often make use of this opportunity to lay in a stock of fresh water for the rest of the year; as the same cause, which pours down the deluge at one season, denies the kindly shower at another. The thunder which attends the fall of these rains is much more terrible than that we are generally acquainted with. With us, the flash is seen at some distance, and the noise shortly after ensues: our thunder generally rolls in one quarter of the sky, and one stroke pursues another. But here it is otherwise; the whole sky seems illuminated with unremitted flashes of lightning; every part of the air seems productive of its own thunders; and every cloud produces its own shock. The strokes come so thick, that the inhabitants can scarcely mark the intervals; but all is one unremitted roar of elementary confusion. It should seem, however, that the lightning of those countries is not so fatal or so dangerous as with us; since in this case the torrid zone would be uninhabitable.

When these terrors have ceased, with which, however, the natives are familiar, meteors of another kind begin to make their appearance. The intense beams of the sun darting upon stagnant waters, that generally cover the surface of the country, raise vapours of various kinds. Floating bodies of fire, which assume different names, rather from their accidental forms than from any real difference between them, are seen without surprise. The *draco volans*, or flying dragon, as it is called; the *ignis fatuus*,[8] or wandering fire; the *fires of St. Helmo*, or the mariner's light; are everywhere frequent: and of these we have numberless descriptions. "As I was riding in Jamaica," says Mr. Barbham, "one morning from my habitation, situated about three miles northwest from Jago de la Vega, I saw a ball of fire, appearing to me of the bigness of a bomb, swiftly falling down with a great blaze. At first I thought it fell into the town; but when I came nearer, I saw many people gathered together, a little to the southward, in the savanna, to whom I rode up, to inquire the cause of their meeting: they were admiring, as I found, the ground's being strangely broke and ploughed up by a ball of fire, which, as they said, fell down there. I observed there were many holes in the ground; one in the middle, of the bigness of a man's head, and five or six smaller round about it, of the bigness of one's fist, and so deep as not to be fathomed by such implements as were at hand. It was observed, also, that all the green herbage was burnt up, near the holes; and there continued a strong smell of sulphur near the place, for some time after."

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[8] The *ignis fatuus*, or will-o'-the-wisp, most philosophers are agreed, is caused by some volatile vapour of the phosphoric kind, probably the phosphoric hydrogen gas. The light from putrescent substances, particularly putrid fish, and those sparks emitted from the sea, or sea-water when agitated in the dark, correspond in appearance with this meteor. Sir Isaac Newton defines the *ignis fatuus* to be "a vapour shining without heat;" and it is usually visible in damp places, about dunghills, burying-grounds, and other situations which are likely to abound in phosphoric matter. A remarkable *ignis fatuus* was observed by Mr. Derham, in some boggy ground between two rocky hills. He was so fortunate as to be able to approach it within two or three yards. It moved with a brisk and desultory motion about a dead thistle, till a slight agitation of the air occasioned, as he supposed, by his near approach to it, caused it to jump to another place; and as he approached, it kept flying before him. He was near enough to satisfy himself that it could not be the shining of glow-worms or other insects—it was one uniform body of light. M. Beccaria mentions two of these luminous appearances, which were frequently observed in the neighbourhood of Bologna, and which emitted a light equal to that of an ordinary faggot. Their motions were unequal, sometimes rising, and sometimes sinking towards the earth; sometimes totally disappearing, though in general they continued hovering about six feet from the ground. They differed in size and figure; and indeed the form of each was fluctuating, sometimes floating like waves and dropping sparks of fire. He was assured that there was not a dark night in the whole year in which they did not appear; nor was their appearance at all affected by the weather, whether cold or hot, snow or rain. They have been known to change their colour from red to yellow; and generally grew fainter as any person approached, vanishing entirely when the observer came very near to them, and appearing again at some distance. Dr. Shaw also describes a singular *ignis fatuus*, which

Ulloa gives an account of one of a similar kind, at Quito.[9] "About nine at night," says he, "a globe of fire appeared to rise from the side of the mountain Pichinca, and so large, that it spread a light over all the part of the city facing that mountain. The house where I lodged looking that way, I was surprised with an extraordinary light, darting through the crevices of the window-shutters. On this appearance, and the bustle of the people in the street, I hastened to the window, and came in time enough to see it, in the middle of its career; which continued from west to south, till I lost sight of it, being intercepted by a mountain, that lay between me and it. It was round; and its apparent diameter about a foot. I observed it to rise from the sides of Pichinca; although, to judge from its course, it was behind that mountain where this congeries of inflammable matter was kindled. In the first half of its visible course, it emitted a prodigious effulgence, then it began gradually to grow dim; so that, upon its disappearing behind the intervening mountain, its light was very faint."

Meteors of this kind are very frequently seen between the tropics; but they sometimes, also, visit the more temperate regions of Europe. We have the description of a very extraordinary one, given us by Montanari, that serves to show to what great heights, in our atmosphere, these vapours are found to ascend. In the year 1676, a great globe of fire was seen at Bononia, in Italy, about three quarters of an hour after sun-set. It passed westward, with a most rapid course, and at the rate of not less than a hundred and sixty miles in a minute, which is much swifter than the force of a cannon-ball, and at last stood over the Adriatic sea. In its course it crossed over all Italy; and, by computation, it could not have been less than thirty-eight miles above the surface of the earth. In the whole line of its course, wherever it approached, the inhabitants below could distinctly hear it, with a hissing noise, resembling that of a fire-work. Having passed away to sea, towards Corsica, it was heard, at last, to go off with a most violent explosion, much louder than that of a cannon: and, immediately after, another noise was heard, like the rattling of a great cart upon a stony pavement; which was, probably, nothing more than the echo of the former sound. Its magnitude, when at Bononia, appeared twice as long as the moon, one way, and as broad the other; so that, considering its height, it could not have been less than a mile long, and half a mile broad. From the height at which this was seen, and there being no volcano on that quarter of the world from whence it came, it is more than probable that this terrible globe was kindled on some part of the contrary side of the globe, in those regions of vapours which we have been just describing; and thus, rising above the air, and passing in a course opposite to that of the earth's motion, in this manner it acquired its amazing rapidity.[10]

To these meteors, common enough southward, we will add one more of a very uncommon kind, which was seen by Ulloa, at Quito, in Peru; the beauty of which will, in some measure, serve to relieve us, after the description of those hideous ones preceding. "At day break," says he, "the whole mountain of Pambamarca, where we then resided, was encompassed with very thick clouds; which the rising of the sun dispersed so far, as to leave only some vapours, too fine to be seen. On the side opposite to the rising sun, and about ten fathoms' distance from the place where we were standing, we saw, as in a looking-glass, each his own image; the head being, as it were, the centre of three circular rainbows, one without the other, and just near enough to each other as that the colours of the internal verged upon those more external; while round all was a circle of

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he saw in the Holy Land. It was sometimes globular, or in the form of a flame of a candle; and immediately afterwards spread itself so much as to involve the whole company in a pale inoffensive light, and then was observed to contract itself again, and suddenly disappear. In less than a minute, however, it would become visible as before, and run along from one place to another: or would expand itself over more than three acres of the adjacent mountains. The atmosphere at this time, he adds, was thick and hazy. In a superstitious age we cannot wonder that these phenomena have all been attributed to supernatural agency; it is one of the noblest purposes of philosophy to release the mind from the bondage of imaginary terrors; and by explaining the modes in which the Divine Providence disposes the different powers of nature, to elevate our thoughts to *one* First Cause; to teach us to see "God in all, and all in God."—Ed.

[9] Ulloa, vol. i. p. 41.

[10] See Supplementary Note A, p. 177.

white, but with a greater space between. In this manner these circles were erected, like a mirror, before us; and as we moved, they moved, in disposition and order. But, what is most remarkable, though we were six in number, every one saw the phenomenon with regard to himself, and not that relating to others. The diameter of the arches gradually altered, as the sun rose above the horizon; and the whole, after continuing a long time, insensibly faded away. In the beginning, the diameter of the inward iris, taken from its last colour, was about five degrees and a half; and that of the white arch, which surrounded the rest, was not less than sixty-seven degrees. At the beginning of the phenomenon, the arches seemed of an oval or elliptical figure, like the disc of the sun; and afterwards became perfectly circular. Each of these was of a red colour, bordered with an orange; and the last bordered by a bright yellow, which altered into a straw colour, and this turned to a green; but in all, the external colour remained red." Such is the description of one of the most beautiful illusions that has ever been seen in nature. This alone seems to have combined all the splendours of optics in one view. To understand the manner, therefore, how this phenomenon was produced, would require a perfect knowledge of optics; which it is not our present province to enter upon. It will be sufficient, therefore, only to observe, that all these appearances arise from the density of the cloud, together with its uncommon and peculiar situation, with respect to the spectator and the sun. It may be observed, that but one of these three rainbows was real, the rest being only reflections thereof. It may also be observed, that whenever the spectator stands between the sun and a cloud of falling rain, a rainbow is seen, which is nothing more than the reflection of the different coloured rays of light from the bosom of the cloud. If, for instance, we take a glass globe, filled with water, and hang it up before us opposite the sun, in many situations it will appear transparent; but if it is raised higher, or sideways, to an angle of forty-five degrees, it will at first appear red; altered a very little higher, yellow; then green, then blue, then violet colour: in short, it will assume successively all the colours of the rainbow; but, if raised higher still, it will become transparent again. A falling shower may be considered as an infinite number of these little transparent globes, assuming different colours, by being placed at their proper heights. The rest of the shower will appear transparent, and no part of it will seem coloured, but such as are at angles of forty-five degrees from the eye, forty-five degrees upward, forty-five degrees on each side, and forty-five degrees downward, did not the plane of the earth prevent us. We therefore see only an arch of the rainbow, the lower part being cut off from our sight by the earth's interposition. However, upon the tops of very high mountains, circular rainbows are seen, because we can see to an angle of forty-five degrees downward, as well as upward or sideways, and therefore we take in the rainbow's complete circle.

In those forlorn regions round the poles, the meteors, though of another kind, are not less numerous and alarming. When the winter begins, and the cold prepares to set in, the same misty appearance which is produced in the southern climates by the heat, is there produced by the contrary extreme.[11] The sea smokes like an oven, and a fog arises which the mariners call the *frost smoke*. This cutting mist commonly raises blisters on several parts of the body; and as soon as it is wafted to some colder part of the atmosphere, it freezes to little icy particles, which are driven by the wind, and create such an intense cold upon land, that the limbs of the inhabitants are sometimes frozen, and drop off.

There, also, halos, or luminous circles round the moon, are oftener seen than in any other part of the earth, being formed by the frost-smoke; although the air otherwise seems to be clear. A lunar rainbow also is often seen there, though somewhat different from that which is common with us; as it appears of a pale white, striped with gray. In these countries also, the aurora borealis streams with peculiar lustre, and variety of colours.[12] In Greenland it generally arises in the east, and darts its sportive fires, with variegated beauty, over the whole horizon. Its appearance is almost constant in winter; and at those seasons when the sun departs to return no more for half-a-year, this meteor kindly rises to supply its beams, and affords sufficient light for all the purposes of existence. However, in the very midst of their tedious nights, the inhabitants are not entirely forsaken. The tops of the mountains are often seen painted with the red rays of the sun; and the poor Greenlander from thence begins to date his chronology. It would appear whimsical to read a Greenland calendar, in which we might be told, That one of their chiefs, having lived forty days, died, at last, of a good old age; and that his widow continued for half-a-day to deplore his loss, with great fidelity, before she admitted a second husband.

The meteors of the day, in these countries, are not less extraordinary than those of the night: mock suns are often reflected upon an opposite cloud; and the ignorant spectator fancies that there are often three or four real suns in the firmament at the same time. In this splendid appearance the real sun is always readily known by its superior brightness, every reflection being seen with diminished splendour. The solar rainbow there is often seen different from ours. Instead of a pleasing variety of colours, it appears of a pale white, edged with a stripe of dusky yellow: the whole being reflected from the bosom of a frozen cloud.

[11] Paul Egede's History of Greenland.

[12] See Supplementary Note B, p. 178.

But of all the meteors which mock the imagination with an appearance of reality, those strange illusions that are seen there, in fine serene weather, are the most extraordinary and entertaining. "Nothing," says Crantz, "ever surprised me more, than on a fine warm summer's day, to perceive the islands that lie four leagues west of our shore, putting on a form quite different from what they are known to have. As I stood gazing upon them, they appeared at first infinitely greater than what they naturally are; and seemed as if I viewed them through a large magnifying glass. They were not thus only made larger, but brought nearer to me. I plainly descried every stone upon the land, and all the furrows filled with ice, as if I stood close by. When this illusion had lasted for a while, the prospect seemed to break up, and a new scene of wonder to present itself. The islands seemed to travel to the shore, and represented a wood, or a tall cut hedge. The scene then shifted, and showed the appearance of all sorts of curious figures; as ships with sails, streamers, and flags; antique elevated castles, with decayed turrets; and a thousand forms, for which fancy found a resemblance in nature. When the eye had been satisfied with gazing, the whole group of riches seemed to rise in air, and at length vanish into nothing. At such times the weather is quite serene and clear; but compressed with such subtile vapours, as it is in very hot weather; and these appearing between the eye and the object, give it all that variety of appearances which glasses of different refrangibilities would have done." Mr. Crantz observes, that commonly a couple of hours afterwards a gentle west wind and a visible mist follow, which puts an end to this *lusus naturæ*.

It were easy to swell this catalogue of meteors with the names of many others, both in our own climate and in other parts of the world. Such as falling stars, which are thought to be no more than unctuous vapours, raised from the earth to small heights, and continuing to shine till that matter which first raised and supported them, being burnt out, they fall back again to the earth with extinguished flame.[13] Burning spears, which are a peculiar kind of aurora borealis; bloody rains, which are said to be the excrements of an insect, that at that time has been raised into the air. Showers of stones, fishes, and ivy-berries, at first, no doubt, raised into the air by tempests in one country, and falling at some considerable distance, in the manner of rain, to astonish another. But omitting these, of which we know little more than what is thus briefly mentioned, I will conclude this chapter with the description of a water-spout: a most surprising phenomenon, not less dreadful to mariners than astonishing to the observer of nature.

These spouts are seen very commonly in the tropical seas, and sometimes in our own. Those seen by Tournefort, in the Mediterranean, he has described as follows: "The first of these," says this great botanist, "that we saw, was about a musket-shot from our ship. There we perceived the water began to boil, and to rise about a foot above its level. The water was agitated and whitish; and above its surface there seemed to stand a smoke, such as might be imagined to come from wet straw before it begins to blaze. It made a sort of a murmuring sound, like that of a torrent heard at a distance, mixed, at the same time, with a hissing noise like that of a serpent; shortly after we perceived a column of this smoke rise up to the clouds, at the same time whirling about with great rapidity. It appeared to be as thick as one's finger; and the former sound still continued. When this disappeared, after lasting for about eight minutes, upon turning to the opposite quarter of the sky, we perceived another, which began in the manner of the former; presently after, a third appeared in the west; and instantly beside it still another arose. The most distant of these three could not be above a musket-shot from the ship. They all continued like so many heaps of wet straw set on fire, that continued to smoke and to make the same noise as before. We soon after perceived each, with its respective canal, mounting up in the clouds, and spreading where it touched; the cloud, like the mouth of a trumpet, making a figure (to express it intelligibly) as if the tail of an animal were pulled at one end by a weight. These canals were of a whitish colour, and so tinged, as I suppose, by the water which was contained in them; for previous to this they were apparently empty, and of the colour of transparent glass. These canals were not straight, but bent in some parts, and far from being perpendicular, but rising in their clouds with a very inclined ascent. But what is very particular, the cloud to which one of them was pointed happening to be driven by the wind, the spout still continued to follow its motion without being broken; and passing behind one of the others, the spouts crossed each other, in the form of a St. Andrew's cross. In the beginning they were all about as thick as one's finger, except at the top, where they were broader, and two of them disappeared; but shortly after, the last of the three increased considerably: and its canal, which was at first so small, soon became as thick as a man's arm, then as his leg, and at last thicker than his whole body. We saw distinctly, through this transparent body, the water which rose up with a kind of spiral motion; and it sometimes diminished a little of its thickness, and again resumed the same, sometimes widening at top, and sometimes at bottom; exactly resembling a gut filled with water, pressed with the fingers to make the fluid rise or fall; and I am well convinced that this alteration in the spout was caused by the wind, which pressed the cloud, and impelled it to give up its contents. After some time its bulk was so diminished as to be no thicker than a man's arm again; and thus swelling and diminishing, it at last became very small. In the end, I observed the sea which was raised above it to resume its level by degrees, and the end of the canal that touched it to become as small as if it had been tied round with a cord; and this continued till the light striking through the cloud took away the view. I still, however, continued to look, expecting that its parts would join again, as I had before seen in one of the others, in which the spout was more than once broken, and yet again came together; but I was disappointed, for the spout appeared no more."

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[13] The shooting or falling star is a common phenomenon, but though so frequently observed, the great distance, and the transient nature of those meteors, added to the entire consumption of their materials, have hitherto frustrated every attempt to ascertain their cause. It is, however, reasonable to suppose, that they are intrinsically the same with the larger meteors, as in most of their properties they perfectly correspond with them.—ED.

Many have been the solutions offered for this surprising appearance. Mr. Buffon supposes the spout here described, to proceed from the operation of fire beneath the bed of the sea; as the waters at the surface are thus seen agitated. However, the solution of Dr. Stuart is not divested of probability; who thinks it may be accounted for by suction, as in the application of a cupping-glass to the skin.

Wherever spouts of this kind are seen, they are extremely dreaded by mariners; for if they happen to fall upon a ship, they most commonly dash it to the bottom. But if the ship be large enough to sustain the deluge, they are at least sure to destroy its sails and rigging, and render it unfit for sailing. It is said that vessels of any force usually fire their guns at them, loaden with a bar of iron; and if so happy as to strike them, the water is instantly seen to fall from them with a dreadful noise, though without any further mischief.

I am at a loss whether we ought to reckon these spouts called *typhons*, which are sometimes seen at land, of the same kind with those so often described by mariners at sea, as they seem to differ in several respects. That, for instance, observed at Hatfield in Yorkshire, in 1687, as it is described by the person who saw it, seems rather to have been a whirlwind than a water-spout. The season in which it appeared was very dry, the weather extremely hot, and the air very cloudy. After the wind had blown for some time with considerable force, and condensed the black clouds one upon another, a great whirling of the air ensued; upon which the centre of the clouds every now and then darted down, in the shape of a thick long black pipe; in which the relater could distinctly view a motion like that of a screw, continually screwing up to itself, as it were, whatever it happened to touch. In its progress it moved slowly over a grove of young trees, which it violently bent in a circular motion. Going forward to a barn, it, in a minute, stripped it of all the thatch, and filled the whole air with the same. As it came near the relater, he perceived that its blackness proceeded from a gyration of the clouds, by contrary winds meeting in a point, or a centre; and where the greatest force was exerted, there darting down like an Archimedes's screw, to suck up all that came in its way. Another which he saw some time after was attended with still more terrible effects; levelling or tearing up great oak trees, catching up the birds in its vortex, and dashing them against the ground. In this manner it proceeded, with an audible whirling noise, like that of a mill; and at length dissolved, after having done much mischief.

But we must still continue to suspend our assent as to the nature of these land-spouts, since they have been sometimes found to drop, in a great column of water, at once upon the earth, and produce an instant inundation,[14] which could not readily have happened had they been caused by the gyration of a whirlwind only. Indeed, every conjecture regarding these meteors seems to me entirely unsatisfactory. They sometimes appear in the calmest weather at sea, of which I have been an eye-witness; and therefore these are not caused by a whirlwind. They are always capped by a cloud; and therefore are not likely to proceed from fires at the bottom. They change place; and therefore suction seems impracticable. In short, we still want facts, upon which to build a rational theory; and instead of knowledge, we must be contented with admiration. To be well acquainted with the appearances of nature, even though we are ignorant of their causes, often constitutes the most useful wisdom.

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[14] Phil. Trans. vol. iv. pp. 2, 108.

NOTE A.—*Meteors.*

Nothing can be a more complete proof of the imperfect state of the science of meteorology, than the discovery of facts, for which not even a conjectural cause in the smallest degree probable can be assigned. Luminous bodies called *meteors*, *fire-balls*, *&c.* have in all ages been observed in the atmosphere, and many of them have been described by eye-witnesses. One of the most remarkable of these was the meteor which appeared in 1783. It was very luminous, and its diameter could not be less than 1,000 yards. It traversed Britain and a considerable part of the continent of Europe, with very great velocity, and at the height of nearly 60 miles from the surface of the earth. Almost all the meteors observed resembled each other. They were luminous at a great height, moved very swiftly, and disappeared in a very short time. Their disappearance was usually accompanied by a loud explosion like a clap of thunder; and it was almost constantly affirmed that heavy stony bodies fell from them to the earth. But though several well-authenticated accounts of the fall of such stones had been from time to time published, little credit was given to them; nor did they indeed attract the attention of philosophers, till Dr. Chladni published a dissertation on the subject in 1794. Two years after, Mr. King published a still more complet collection of examples, both ancient and modern; many of them supported by such evidence that it was impossible to reject it. These two dissertations excited considerable attention: but the opinion, that stones had really fallen from the atmosphere, was considered as so extraordinary, and so contrary to what we know of the constitution of the air, that most people hesitated or refused their assent. Meanwhile Mr. Howard took a different method of investigating the subject. He not only collected all the recent and well-authenticated accounts of the fall of stony bodies, and examined the evidence of their truth, but procured specimens of the stones which were said to have fallen in different places, compared them together, and subjected them to a chemical analysis. The result was, that all these stony bodies differ completely from every other known stone; that they all resemble each other, and that they are all composed of the same ingredients, although found in climates and in soils exceedingly different from each other. The stones when they fall are always hot. They commonly bury themselves some depth under ground. Their size differs from a few ounces to several tons. They are usually roundish, and always covered with a black crust. In many cases they smell strongly of sulphur. The black crust, from the analysis of Howard, consists chiefly of iron. The outer surface of these stones is rough. When broken, they appear of an ash-grey colour, and of a granular texture like a coarse sandstone. The metals found in them are iron, nickel, chromium, and cobalt. Now these constitute the whole of the magnetic metals. Various attempts have been made to account for their appearance. But such is the obscurity of the subject, so little progress have we made in the science of meteorology, that no opinion in the slightest degree probable has hitherto been advanced. It was first supposed that the bodies in question had been thrown out of volcanoes; but the immense distance from all volcanoes at which they have been found, and the absence of all similar stones from volcanic productions, render this opinion untenable. Chladni endeavoured to prove that the meteors from which they fell were bodies floating in space, unconnected with any planetary system, attracted by the earth in their progress, and kindled by their rapid motion through the atmosphere. But this opinion is not susceptible of any direct evidence, and can scarcely be believed, one would think, even by Dr. Chladni himself. Laplace suggests the probability of their having been thrown off by the volcanoes of the moon: but the meteors which almost always accompany them, and the swiftness of their horizontal motion, militate too strongly against this opinion. The greater number of philosophers consider them, with Mr. King and Sir William Hamilton, as concretions actually formed in the atmosphere. This opinion is undoubtedly the most probable of all; but in the present state of our knowledge, it would be absurd to attempt any explanation of the manner in which they are formed. The masses of native iron found in South America, in Siberia, and near Agnam, contain nickel, as has been ascertained by Proust, Howard, and Klaproth, and resemble exactly the iron found in the stones fallen from the atmosphere. We have every reason therefore to ascribe to them the same original: and this accordingly is almost the uniform opinion of philosophers. Klaproth has shown that real native iron is distinguished from meteoric iron by the absence of nickel. Upon the whole, we may consider these stony and metallic masses as fragments of fire-balls which have burst in the atmosphere; but the origin and cause of these fire-balls will perhaps for ages baffle all the attempts of philosophers to explain them.—*See Thomson's System of Chemistry.*

NOTE B.—*The Aurora Borealis.*

The aurora borealis may with propriety be distinguished into two kinds, the tranquil and the varying. The tranquil shines with a mild and steady light, very much resembling the clearness of twilight; and preserves, for a considerable time, the form in which it first appears with little or no variation. The varying aurora is still more remarkable in its appearance, and occasionally exhibits the most brilliant and rapidly diversified forms. In that region of the air which is directly towards the north, or which stretches from the north towards the east or west, there appears at first a cloud in the horizon, which rarely rises to the height of 40 degrees. This cloud is sometimes contiguous to the horizon, sometimes detached from it; in which last case the intermediate sky appears of a bright blue colour. The cloud occupies a portion of the heavens extending in length from 5 to 100 degrees, and sometimes still farther. It is generally white and shining, but sometimes black and thick. Its upper edge is parallel to the horizon, bordered by a long train of light which rises higher in some places than in others. It appears also bent in the form of a bow, or like the segment of a sphere which has its centre considerably beneath the horizon; and sometimes a large white or luminous band is visible skirting the superior edge of the black cloud. The dark part of the cloud becomes white and luminous when the aurora has shone for some time, and after it has sent forth several bright and fiery rays. Then, from the superior edge of the cloud, there issue rays in the form of jets, which are sometimes many, sometimes few in number, sometimes close together, sometimes removed several degrees asunder. These jets diffuse a very brilliant light, as if a luminous or fiery liquor were driven with impetuosity from a syringe. The jet increases in brightness, and has less bulk at the place where it issues from the cloud; while it dilates itself and grows dimmer as it goes farther and farther off. Then there arises from a large opening in the cloud, a luminous train or column, of which the motion is at first gentle and uniform, and which increases in size as it advances. The dimensions and duration of these columns, however, vary considerably. Their light is sometimes white, sometimes reddish, or even blood colour; and, as they advance, their colours change, till they form a kind of arch in the heavens. When several of these columns, which have issued from different places, encounter each other in the zenith, they intermingle with each other, and form at their junction a small thick cloud, which seems as it were to kindle, and sends forth a light considerably more brilliant than that of any of the separate columns. This light changes to green, blue, and purple; and quitting its original situation, it directs itself toward the south, under the form of a small bright cloud. When no more columns are seen to issue, the cloud assumes the appearance of the morning dawn, and insensibly dissipates itself. The duration of the aurora is very various. Sometimes it is formed and disappears in the course of a few minutes. At other times it lasts during the whole night, or even for two or three days together. In high northern latitudes, as those of Sweden, Lapland, and Siberia, the aurora borealis are singularly resplendent, and even terrific. They frequently occupy the whole of the heavens, and eclipse the splendour of the stars, planets, and moon, and sometimes even of the sun himself. In the north-eastern districts of Siberia, according to the description of Gmelin, cited and translated by Dr. Blagden, (Phil. Trans. vol. lxxiv. p. 228,) the aurora is observed to "begin with single bright pillars, rising in the north, and almost at the same time in the north-east, which, gradually increasing, comprehend a large space in the heavens, rush about from place to place with incredible velocity, and finally almost cover the whole sky up to the zenith, and produce an appearance as if a vast tent was expanded in the heavens, glittering with gold, rubies, and sapphire. As soon as the phenomena of electricity, and the laws by which they are governed, were tolerably understood, philosophers very naturally had recourse to this agent, as affording a satisfactory explanation of the aurora borealis. The brilliancy of its light, the rapidity of its motions, and the instantaneous changes of form which it underwent, all seemed plainly to point to this powerful element as the cause of these striking phenomena. A small quantity of electricity excited in a highly rarefied atmosphere, or in a medium approaching to a perfect vacuum, will exhibit luminous appearances entirely resembling the aurora borealis, for a very considerable space of time. With respect to the variations of colour which we find in the aurora borealis, these seem fairly ascribable to the different degrees of rarefaction of the air; for the same electricity which appears white in a very rare medium, becomes blue, purple, or red, in a medium of increased density; as is fully evinced by the following experiment. Let an electrical machine and an air-pump be so disposed, that while the machine is worked, a succession of strong sparks shall be communicated from the prime conductor to a metallic knob attached to the top of the receiver of the air-pump. Let now the exhaustion of the receiver proceed, and we shall soon perceive the electricity forcing itself through the air within it in a visible stream. At first this stream is of a deep purple colour; but, as the exhaustion advances, it changes to blue; and at length to an intense white, with which the whole receiver becomes completely filled.

This experiment would appear to establish the identity of the aurora borealis with electric light; and it may be mentioned as collateral proofs of this identity, that the atmosphere is found by the electrometer, to abound with electricity when the aurora shines forth; that the aurora when strong, is accompanied with the whizzing or crackling sound of electricity; and that the magnetic needle is evidently disturbed by the aurora as well as by the action of an electrical machine, or by the natural electricity of a thunder storm. The course of the aurora is uniformly from the poles towards the equator; and supposing it to consist in a stream of electric light, the following reasons may be assigned for its constantly preserving this course. Extreme cold renders almost all bodies electric, or disposed to accumulate electricity; while heat and moisture occasion a conducting power. Air, when dry and cold, is powerfully electric; and hence the beautiful phenomena of the aurora are confined to the polar regions, and appear by night and not by day, and in winter rather than in summer. The inferior part of the atmosphere, between the tropics, is violently heated, during the daytime, by the reflection of the sun's rays from the earth, while the superior parts retain their original cold. It is also impregnated with moisture exhaled by the powerful heat which then acts upon the earth. It is therefore in the conducting state, and readily communicates the electricity of the superior regions to the clouds which float in it, or to the body of the earth. Hence the awful electrical phenomena of the tropical regions, exhibited in thunder and lightning, water-spouts, whirlwinds, and the most tremendous tempests. The electrical fluid is thus conveyed in great quantities from the upper parts of the atmosphere between the tropics, to the lower stratum, and thence to the earth; and the inferior and warm atmosphere, having once exhausted itself, must necessarily be recruited from the upper and colder regions.

CHAP. XXII.

THE CONCLUSION.

Having thus gone through a particular description of the earth, let us now pause for a moment to contemplate the great picture before us. The universe may be considered as the palace in which the Deity resides; and this earth as one of its apartments. In this, all the meaner races of animated nature mechanically obey him; and stand ready to execute his commands without hesitation. Man alone is found refractory; he is the only being endued with a power of contradicting these mandates. The Deity was pleased to exert superior power in creating him a superior being; a being endued with the choice of good and evil; and capable, in some measure, of co-operating with his own intentions. Man, therefore, may be considered as a limited creature, endued with powers imitative of those residing in the Deity. He is thrown into a world that stands in need of his help; and has been granted a power of producing harmony from partial confusion.

If, therefore, we consider the earth as allotted for our habitation, we shall find that much has been given us to enjoy, and much to amend; that we have ample reasons for our gratitude, and still more for our industry. In those great outlines of nature, to which art cannot reach, and where our greatest efforts must have been ineffectual, God himself has finished these with amazing grandeur and beauty. Our beneficent Father has considered these parts of nature as peculiarly his own; as parts which no creature could have skill or strength to amend: and therefore made them incapable of alteration, or of more perfect regularity. The heavens and the firmament show the wisdom and the glory of the workman. Astronomers, who are best skilled in the symmetry of systems, can find nothing there that they can alter for the better. God made these perfect, because no subordinate being could correct their defects.

When, therefore, we survey nature on this side, nothing can be more splendid, more correct, or amazing. We there behold a Deity residing in the midst of a universe, infinitely extended every way, animating all, and cheering the vacuity with his presence! We behold an immense and shapeless mass of matter, formed into worlds by his power, and dispersed at intervals, to which even the imagination cannot travel! In this great theatre of his glory, a thousand suns, like our own, animate their respective systems, appearing and vanishing at Divine command. We behold our own bright luminary fixed in the centre of its system, wheeling its planets in times proportioned to their distances, and at once dispensing light, heat, and action. The earth also is seen with its twofold motion; producing, by the one, the change of seasons; and by the other, the grateful vicissitudes of day and night. With what silent magnificence is all this performed! with what seeming ease! The works of art are exerted with interrupted force; and their noisy progress discovers the obstructions they receive: but the earth, with a silent steady rotation, successively presents every part of its bosom to the sun; at once imbibing nourishment and light from that parent of vegetation and fertility.

But not only provisions of heat and light are thus supplied, but its whole surface is covered with a transparent atmosphere, that turns with its motion, and guards it from external injury. The rays of the sun are thus broken into a genial warmth; and while the surface is assisted, a gentle heat is produced in the bowels of the earth, which contributes to cover it with verdure. Waters also are supplied in healthful abundance, to support life, and assist vegetation. Mountains arise, to diversify the prospect, and give a current to the stream. Seas extend from one continent to the other, replenished with animals that may be turned to human support; and also serving to enrich the earth with a sufficiency of vapour. Breezes fly along the surface of the fields, to promote health and vegetation. The coolness of the evening invites to rest; and the freshness of the morning renews for labour.

Such are the delights of the habitation that has been assigned to man! Without any one of these, he must have been wretched; and none of these could his own industry have supplied. But while many of his wants are thus kindly furnished on the one hand, there are numberless inconveniences to excite his industry on the oth
habitation, though provided with all th
niences of air, pasturage, and water, is b
ert place, without human cultivation. T
animal finds more conveniences in the
nature than he who boasts himself th
The whirlwind, the inundation, and all t
ities of the air, are peculiarly terrible
who knows their consequences, and,
tance, dreads their approach. The ear
where human art has not pervaded, p
frightful gloomy appearance. The fo
dark and tangled; the meadows overgr
rank weeds; and the brooks stray with
termined channel. Nature, that has b
to every lower order of beings, has b
neglectful with regard to him; to th
uncontriving man the earth is an abode
lation, where his shelter is insufficient,
food precarious.

A world thus furnished with advan
the one side, and inconveniences on the
the proper abode of reason, is the fittest
cise the industry of a free and a thinki
ture. These evils, which art can rem
prescience guard against, are a proper ca
exertion of his faculties; and they tend
to assimilate him to his Creator. God
with pleasure that being which he h
converting the wretchedness of his natu
tion into a theatre of triumph; bringin
headlong tribes of nature into subjecti
will; and producing that order and u
upon earth, of which his own heavenly
so bright an example.

A HISTORY OF
THE EARTH AND ANIMATED NATURE.

PART SECOND.
HISTORY OF ANIMATED NATURE.
QUADRUPEDS.

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IISTORY OF ANIMATED NATURE.

PART SECOND.—OF QUADRUPEDS.

BOOK I.

INTRODUCTORY.

CHAP. I.

ISON OF ANIMALS WITH THE INFERIOR RANKS OF CREATION.

en an account of the earth in general,
ıntages and inconveniences with which
we now come to consider it more
Having described the habitation, we
ly led to inquire after the inhabit-
idst the infinitely different produc-
the earth offers, and with which it
ere covered, animals hold the first
ell because of the finer formation of
as of their superior power. The
hich is fixed to one spot, and obliged
ts accidental supplies of nourishment,
ısidered as the prisoner of nature.
orrect the disadvantages of its situa-
shield itself from the dangers that
every object that has motion may be
r.

als are endowed with powers of mo-
ence. The greatest part are capable,
place, of commanding nature; and
ging her to furnish that nourishment
ost agreeable to their state. Those
fixed to one spot, even in this seem-
ss situation, are, nevertheless, pro-
external injury, by a hard shelly
hich they often can close at pleasure,
fend themselves from every assault.
think, we may draw the line between
and vegetable kingdoms. Every
ome means or other, finds protection
; either from its force or courage,
or cunning. Some are protected by
nvenient places; and others by tak-
in a hard resisting shell. But vege-
otally unprotected; they are exposed
sailant, and patiently submissive in
. In a word, an animal is an organ-
that is, in some measure, provided for
rity; a vegetable is destitute of every

gh it is very easy, without the help of definitions, to distinguish a plant from an animal, yet both possess so many properties so much alike, that the two kingdoms, as they are called, seem mixed with each other. Hence, it frequently puzzles to tell exactly where animal life begins, and vegetative terminates; nor indeed is it easy to resolve, whether some objects offered to view be of the lowest of the animal, or the highest of the vegetable races. The sensitive plant, that moves at the touch, seems to have as much perception as the fresh-water polypus, that is possessed of a still slower share of motion. Besides, the sensitive plant will not reproduce upon cutting in pieces, which the polypus is known to do; so that the vegetable production seems to have the superiority. But, notwithstanding this, the polypus hunts for its food, as most other animals do. It changes its situation; and therefore possesses a power of choosing its food, or retreating from danger. Still, therefore, the animal kingdom is far removed above the vegetable; and its lowest denizen is possessed of very great privileges, when compared with the plants with which it is often surrounded.

However, both classes have many resemblances, by which they are raised above the unorganized and inert masses of nature. Minerals are mere inactive, insensible bodies, entirely motionless of themselves, and waiting some external force to alter their forms or their properties. But it is otherwise with animals and vegetables; these are endued with life and vigour; they have their state of improvement and decay; they are capable of reproducing their kinds; they grow from seeds in some, and from cuttings in others; they seem all possessed of sensation in a greater or less degree; they both have their enmities and affections; and as some animals are, by nature, impelled to violence, so some plants are found to exterminate all others, and make a wilderness of the places round them. As the lion makes a desert of the forest where it resides, thus no other plant will grow under the shade of the manchineel tree. Thus, also, that plant, in the West Indies, called *caraguata*, clings round whatever tree it happens to approach: there it quickly gains the ascendant; and loading the tree with a verdure not its own, keeps away that nourishment designed to feed the trunk; and, at last, entirely destroys its supporter. As all animals are ultimately supported upon vegetables, so vegetables are greatly propagated by being made a part of animal food. Birds distribute the seeds wherever they fly, and quadrupeds prune them into greater luxuriance. By these means the quantity of food, in a state of nature, is kept equal to the number of the consumers; and, lest some of the weaker ranks of animals should find nothing for their support, but all the provisions be devoured by the strong, different vegetables are appropriated to different appetites. If, transgressing this rule, the stronger rank should invade the rights of the weak, and, breaking through all regard to appetite, should make an indiscriminate use of every vegetable, nature then punishes the transgression, and poison marks the crime as capital.

If, again, we compare vegetables and animals, with respect to the places where they are found, we shall find them bearing a still stronger similitude. The vegetables that grow in a dry and sunny soil, are strong and vigorous, though not luxuriant; so also are the animals of such a climate. Those, on the contrary, that are the joint product of heat and moisture, are luxuriant and tender; and the animals assimilating to the vegetable food, on which they ultimately subsist, are much larger in such places than in others. Thus, in the internal parts of South America and Africa, where the sun usually scorches all above, while inundations cover all below, the insects, reptiles, and other animals, grow to a prodigious size: the earth-worm of America is often a yard in length, and as thick as a walking cane; the boiguacu, which is the largest of the serpent kind, is sometimes forty feet in length; the bats in those countries are as big as a rabbit; the toads are bigger than a duck; and their spiders are as large as a sparrow. On the contrary, in the cold frozen regions of the north, where vegetable nature is stinted of its growth, the few animals in those climates partake of the diminution; all the wild animals, except the bear, are much smaller than in milder countries; and such of the domestic kinds as are carried thither, quickly degenerate, and grow less. Their very insects are of the minute kinds, their bees and spiders being not half so large as those in the temperate zone.

The similitude between vegetables and animals is nowhere more obvious than in those that belong to the ocean, where the nature of one is admirably adapted to the necessities of the other. This element, it is well known, has its vegetables, and its insects that feed upon them, in great abundance. Over many tracts of the sea, a weed is seen floating, which covers the surface, and gives the resemblance of a green and extensive meadow. On the under side of these unstable plants, millions of little animals are found adapted to their situation. For as their ground, if I may so express it, lies over their heads, their feet are placed upon their backs; and as land animals have their legs below their bodies, these have them above. At land also, most animals are furnished with eyes to see their food; but at sea, almost all the reptile kinds are without eyes, which might only give them prospects of danger at a time when unprovided with the means of escaping it.[1]

Thus, in all places, we perceive an obvious similitude between the animals and the vegetables of every region. In general, however, the most perfect races have the least similitude to the vegetable productions on which they are ultimately fed; while, on the contrary, the meaner the animal, the more local it is found to be, and the more it is influenced by the varieties of the soil where it resides. Many of the more humble reptile kinds are not only confined to one country, but also to a plant; nay, even to a leaf. Upon that they subsist; increase with its vegetation, and seem to decay as it declines. They are merely the circumscribed inhabitants of a single vegetable: take them from that and they instantly die; being entirely assimilated to the plant they feed on, assuming its colour, and even its medicinal properties. For this reason there are infinite numbers of the meaner animals that we have never an opportunity of seeing in this part of the world; they are incapable of living separate from their kindred vegetables, which grow only in a certain climate.

Such animals as are formed more perfect, lead a life of less dependence; and some kinds are found to subsist in many parts of the world at the same time. But, of all the races of animated nature, man is the least affected by the soil where he resides, and least influenced by the variations of vegetable sustenance: equally unaffected by the luxuriance of the warm climates, or the sterility of the poles, he has spread his habitations over the whole earth; and finds subsistence as well amidst the ice of the north as the burning deserts under the Line. All creatures of an inferior nature, as has been said, have peculiar propensities to peculiar climates; they are circumscribed to zones, and confined to territories, where their proper food is found in greatest abundance; but man may be called the animal of every climate, and suffers but very gradual alterations from the nature of any situation.

As to animals of a meaner rank, whom man compels to attend him in his migrations, these being obliged to live in a kind of constraint, and upon vegetable food often different from that of their native soil, they very soon alter their natures with the nature of their nourishment, assimilate to the vegetables upon which they are fed, and thus assume very different habits as well as appearances. Thus man, unaffected himself, alters and directs the nature of other animals at his pleasure; increases their strength for his delight, or their patience for his necessities.

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[1] Linnæi Amœnitates, vol. v. p. 68.

This power of altering the appearances of things, seems to have been given him for very wise purposes. The Deity, when he made the earth, was willing to give his favoured creature many opponents, that might at once exercise his virtues, and call forth his latent abilities. Hence we find, in those wide uncultivated wildernesses, where man, in his savage state, owns inferior strength, and the beasts claim divided dominion, that the whole forest swarms with noxious animals and vegetables; animals as yet undescribed, and vegetables which want a name. In those recesses, nature seems rather lavish than magnificent in bestowing life. The trees are usually of the largest kind, covered round with parasite plants, and interwoven at the tops with each other. The boughs, both above and below, are peopled with various generations; some of which have never been upon the ground, and others have never stirred from the branches on which they were produced. In this manner millions of minute and loathsome creatures pursue a round of uninterrupted existence, and enjoy a life scarcely superior to vegetation. At the same time, the vegetables in those places are of the larger kinds, while the animal race is of the smaller; but man has altered this disposition of nature; having, in a great measure, levelled the extensive forests, cultivated the softer and finer vegetables, destroyed the numberless tribes of minute and noxious animals, and taken every method to increase a numerous breed of the larger kinds. He thus has exercised a severe control; unpeopled nature, to embellish it, and diminished the size of the vegetable, in order to improve that of the animal kingdom.

To subdue the earth to his own use, was, and ought to be, the aim of man; which was only to be done by increasing the number of plants, and diminishing that of animals: to multiply existence *alone*, was that of the Deity. For this reason, we find in a state of nature, that animal life is increased to the greatest quantity possible; and we can scarcely form a system that could add to its numbers. First, plants, or trees, are provided by nature of the largest kinds; and, consequently, the nourishing surface is thus extended. In the second place, there are animals peculiar to every part of the vegetable, so that no part of it is lost. But the greatest possible increase of life would still be deficient, were there not other animals that lived upon animals; and these are, themselves, in turn, food for some other greater and stronger set of creatures. Were all animals to live upon vegetables alone, thousands would be extinct that now have existence, as the quantity of their provision would shortly fail. But, as things are wisely constituted, one animal now supports another; and thus, all take up less room than they would by living on the same food; as, to make use of a similar instance, a greater number of people may be crowded into the same space, if each is made to bear his fellow upon his shoulders.[2]

To diminish the number of animals and increase that of vegetables, has been the general scope of human industry; and if we compare the utility of the kinds, with respect to man, we shall find, that of the vast variety in the animal kingdom, but very few are serviceable to him; and, in the vegetable, but very few are entirely noxious. How small a part of the insect tribes, for instance, are beneficial to mankind, and what numbers are injurious! In some countries they almost darken the air: a candle cannot be lighted without their instantly flying upon it, and putting out the flame.[3] The closest recesses are no safeguard from their annoyance; and the most beautiful landscapes of nature only serve to invite their rapacity. As these are injurious, from their multitudes, so most of the larger kinds are equally dreadful to him from their courage and ferocity. In the most uncultivated parts of the forest these maintain an undisputed empire; and man invades their retreats with terror. These are dreadful; and there are still more which are utterly useless to him, that serve to take up the room which more beneficial creatures might possess; and incommode him rather with their numbers than their enmities. Thus, in a catalogue of land-animals, that amounts to more than twenty thousand, we can scarcely reckon up a hundred that are any way useful to him; the rest being either all his open or his secret enemies, immediately attacking him in person, or intruding upon that food he has appropriated to himself. Vegetables, on the contrary, though existing in greater variety,[4] are but few of them noxious. The most deadly poisons are often of great use in medicine; and even those plants that only seem to cumber the ground, serve for food to that race of animals which he has taken into friendship or protection. The smaller tribes of vegetables, in particular, are cultivated, as contributing either to his necessities or amusement; so that vegetable life is as much promoted by human industry, as animal life is controlled and diminished.

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[2] See Supplementary Note to this chapter, p. 186. —ED.

[3] Ulloa's Description of Guayaquil.

[4] This is not correct. Mr. Loudon, in his 'Encyclopedia of Agriculture,' says: "On a superficial view, vegetables seem more abundant than animals; so contrary, however, is this to fact, that the species of animals, when compared with those of plants, may be considered in the proportion of 10 to 1. Hence it follows that botany, when compared with zoology, is a very limited study: plants, when considered in relation to insects alone, bear no proportion in the number of the species. The phanogamous plants of Britain have been estimated in round numbers at 1,500, while the insects that have already been discovered in this country (and probably many hundreds still remain unknown) amount to 10,000, which is more than six insects to one plant."—ED.

Hence it was not without a long struggle, and various combinations of experience and art, that man acquired his present dominion. Almost every good that he possesses was the result of the contest; for, every day, as he was contending, he was growing more wise: and patience and fortitude were the fruits of his industry.

Hence, also, we see the necessity of some animals living upon each other, to fill up the plan of Providence; and we may, consequently, infer the expediency of man's living upon all. Both animals and vegetables seem equally fitted to his appetites; and, were any religious or moral motives to restrain him from taking away life, upon any account, he would only thus give existence to a variety of beings made to prey upon each other; and, instead of preventing, multiply mutual destruction.[5]

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[5] NOTE.—*The Law of Prey.*

The *law of prey* is the existing law of nature; of organized matter. It is the law whereby the balance of creation appears to be preserved, one class preying on another, and also individuals of the same class preying on each other,—vegetables as well as animals. Throughout organic creation, nature has provided, that every race, animal and vegetable, shall produce more offspring than is required to fill the spaces the parents occupy. For this there seems to be two reasons; first, to colonize the uninhabited spaces at the outset, and secondly, to supply casualties. To prevent too great accumulations, where casualties do not occur, the *law of prey* comes in force. In natural forests, the trees tower upwards, side by side, each striving to out-top its neighbour, till all alike become weak, lose all development of lateral branches, and possess only an unnatural tuft at their top in the likeness of a broom, the timbers of their long thin trunks being of most inferior quality. Nor does either grass or brushwood grow in the spaces between their roots. In their competitive struggle, the sun-light is shut out from between their stems, they have destroyed all races of plants except themselves, and they have degenerated in the process. But when a river or a mountain ravine breaks in upon the monotonous level, or where the agency of man, or fire, has opened up space, then, the trees exposed to air and light, and thinned in their numbers, become strong and healthy, develop lateral branches, and produce strong timber. So also, in the process of natural decay, as the weakest dry up and fall the remainder flourish. But it is under the care of man, where the process of thinning is judiciously performed, that trees attain their greatest perfection, when the competitive process is at an end. There is also another process of thinning which nature has provided, in the vegetable-eating tribes of animals, which in some cases carry the process so far that the forests are actually extirpated, as in the steppes of Tartary, and the pampas and savannahs of Southern America. Forests thus extirpated cannot rise again, the young trees are bitten off like grass as fast as they shoot, and grasses and herbs become the sole occupants of the land; grass, which becomes a matted turf, and loses the characteristics of a seed-bearing plant, remaining a mass of imperfect vegetation. Yet, select from amongst this mass individual plants, cultivate them carefully through a series of years, and seed will be developed. Replant this seed, and select the finest seeds for the next crop, and one may, perhaps, become a plant of wheat, another of barley, another of oats, another of rye. And when the wheat has attained its greatest state of perfection, and the seed is produced in quantities at pleasure, let a field be thickly sown with it, and let the crop shed its seed into the ground and grow up the following year, the crops of straw will be large, and the seed reduced. Let this process be repeated through a sufficient period of years, and the wheat will return to the original state of grass from which it was developed. The peasantry of Chilé express this known fact, by saying *vuelve centeno*, "it becomes rye." It is the same with the wild kale, which may be cultivated into every variety of cabbage by human care, but which, if neglected, will become kale again. Competition, with weeds and other plants, will reduce it to its original type.

Had the forests been left to the operations of the *law of prey*, acting against them, and not for them, by their own competition, and by the rapacity of the vegetable-eating tribes, they must wholly have disappeared. But nature provided a balance in the carnivorous animals, who thin their numbers by the same *law of prey*, and by this reciprocal action and re-action, forests, grass, and animals, were kept in abundance to greet the advent of man, as fuel, implements, houses, and food, to supply the wants of his savage state. Man, as a hunter, was little more than instinctive, as a wild beast. While his numbers were few, and birds, beasts, and other animals were in surplus, he would not quarrel; but as they became scarce with man's increase of numbers, the *law of prey* came again into operation, man against man. Rival claims to hunting-grounds begat strife, and the numbers of men were kept thinned, till the balance was adjusted between mouths and food. And, in this mode, the finest and strongest trees, animals, and men, were preserved to keep up the races, while the weaker were destroyed; a law of nature to prevent deterioration.

It must be sufficiently obvious that the *law of prey* was essential to progress, in the merely instinctive state. Every organized being, plant, or animal, had its food prepared for it by nature, throughout a series of gradations. But with the advent of man, provision was made for the development of a new law, gradually to abrogate the *law of prey*, viz. The *law of human reason*. The cultivation of the earth, for the production of improved vegetation, is amongst its earliest efforts. The competition for hunting-grounds lessened, when, from a limited space, the amount of food could be insured, till such time as the consequent increase of population restored the rivalry. And the history of all nations called civilized, is that of a constant struggle between population and food, skill and industry increasing the quantity of food, and population, thus excited, growing beyond the quantity, till the application of fresh skill again changed their relative proportions. The same has been the case with fuel. Trees disappeared under dense population, and then the stores of coal, hived up by nature, were dug from the surface and near the surface, and, as exhaustion took place, man's growing skill pierced deeper and deeper still. Had not fuel been thus provided, the numbers of mankind must have been very limited, and great parts of the earth left uninhabited.

It is an established fact, that vegetable-eating animals are far inferior in energy to the carnivorous tribes; but the omnivorous are the most generally intelligent, amongst the lower animals, as well as amongst mankind. The Bramins of India and the Celts of Ireland are dominated over by the omnivorous English. Rammohun Roy was accustomed to say that when the Eastern Indians should begin to eat meat with their rice, they would take part with the English in governing. The bean-eating peasantry of Chilé are quiet and submissive; the flesh-eating wanderers of Paraguay and La Plata are ferocious and intractable."—*From a paper in the Illuminated Magazine.*

CHAP. II.

OF THE GENERATION OF ANIMALS.

we survey animals in their state of matu-
id performing the functions adapted to
spective natures, method requires that we
consider them in the more early periods
existence. There has been a time when
udest and the noblest animal was a par-
f the same imbecility with the meanest
and, while yet a candidate for existence,
helpless and contemptible. In their in-
state, all are upon a footing; the insect
e philosopher being equally insensible,
with matter, and unconscious of exist-
Where, then, are we to begin with the his-
those beings, that make such a distin-
figure in the creation? Or, where lie
eculiar characters in the parts that go to
p animated nature—that mark one ani-
destined to creep in the dust, and another
er on a throne?

has been a subject that has employed the
y of all ages, and the philosophers of every
re attempted the solution. In tracing
to her most hidden recesses, she becomes
ute or obscure for our inspection; so that
it impossible to mark her first differences,
ver the point where animal life begins,
cause that conduces to set it in motion.
w little more than that the greatest num-
nimals require the concurrence of a male
nale to reproduce their kind; and that
stinctly and invariably are found to beget
es of their own species. Curiosity has,
e, been active in trying to discover the
ate result of this union; how far either
tributes to the bestowing animal life, and
r it be to the male or female, that we are
debted for the privilege of our existence.

ocrates has supposed that fecundity pro-
from the mixture of the seminal liquor of
xes, each of which equally contributes to
nation of the incipient animal. Aristotle,
ther hand, would have the seminal liquor
male alone to contribute to this purpose,
he female supplied the proper nourish-
r its support. Such were the opinions
e fathers of philosophy; and these con-
to be adopted by the naturalists and
en of succeeding ages, with blind ven-
At length Steno and Harvey, taking
y for their guide, gave mankind a nearer
nature just advancing into animation.
erceived, in all such animals as produced
ung alive, two glandular bodies, near the
resembling that ovary, or cluster of small
hich is found in fowls; and from the
between both, they gave these also the
ovaria. These, as they resembled eggs,
turally concluded had the same offices; and, therefore, they were induced to think that all animals, of what kind soever, were produced from eggs. At first, however, there was some altercations raised against this system: for, as these ovaria were separated from the womb, it was objected that they could not be any way instrumental in replenishing that organ, with which they did not communicate. But, upon more minute inspection, Fallopius, the anatomist, perceived two tubular vessels depending from the womb, which, like the horns of a snail, had a power of erecting themselves, of embracing the ovaria, and of receiving the eggs, in order to be fecundated by the seminal liquor. This discovery seemed, for a long time after, to fix the opinions of philosophers. The doctrine of Hippocrates was re-established, and the chief business of generation was ascribed to the female. This was for a long time the established opinion of the schools; but Leuwenhoeck, once more, shook the whole system, and produced a new schism among the lovers of speculation. Upon examining the seminal liquor of a great variety of male animals with microscopes, which helped his sight more than that of any of his predecessors, he perceived therein infinite numbers of little living creatures, like tadpoles, very brisk, and floating in the fluid with a seeming voluntary motion. Each of these, therefore, was thought to be the rudiments of an animal, similar to that from which it was produced; and this only required a reception from the female, together with proper nourishment, to complete its growth. The business of generation was now, therefore, given back to the male a second time, by many; while others suspended their assent, and chose rather to confess ignorance than to embrace error.[1]

In this manner has the dispute continued for several ages, some accidental discovery serving, at intervals, to renew the debate, and revive curiosity. It was a subject where speculation could find much room to display itself; and Mr. Buffon, who loved to speculate, would not omit such an opportunity of giving scope to his propensity. According to this most pleasing of all naturalists, the microscope discovers that the seminal liquor, not only of males, but of females also, abounds in these moving little animals which have been mentioned above, and that they appear equally brisk in either fluid. These he takes not to be real animals, but organical particles, which being simple, cannot be said to be organized themselves, but go to the composition of all organized bodies whatsoever; in the same manner as a tooth, in the wheel of a watch, cannot be called either the wheel or the watch and yet contributes to the sum of the machine. These organical particles are, according to him, diffused throughout all nature, and to be found not only in the seminal liquor, but in most other fluids in the parts of vegetables, and all parts of animated nature. As they happen, therefore, to be differently applied, they serve to contribute a part of the animal, or the vegetable, whose growth they serve to increase, while the superfluity is thrown off in the seminal liquor of both sexes, for the reproduction of other animals or vegetables of the same species. These particles assume different figures, according to the receptacle into which they enter; falling into the womb, they unite into a fœtus; beneath the bark of a tree they pullulate into branches; and, in short, the same particles that first formed the animal in the womb, contribute to increase its growth when brought forth.[2]

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[1] Bonet Considerations sur les Corps Organises.

To this system it has been objected, that it is impossible to receive organical substances without being organized; and that, if divested of organization themselves, they could never make an organized body, as an infinity of circles could never make a triangle. It has been objected, that it is more difficult to conceive the transformation of these organical particles, than even that of the animal, whose growth we are inquiring after; and this system, therefore, attempts to explain one obscure thing by another still more obscure.

But an objection, still stronger than these, had been advanced by an ingenious countryman of our own; who asserts, that these little animals, which thus appear swimming and sporting in almost every fluid we examine with a microscope, are not real living particles, but some of the more opaque parts of the fluid that are thus increased in size, and seem to have a much greater motion than they have in reality. For the motion being magnified with the object, the smallest degree of it will seem considerable; and a being almost at rest, may, by these means, be apparently put into violent action. Thus, for instance, if we look upon the sails of a windmill moving at a distance, they appear to go very slow; but, if we approach them, and thus magnify their bulk to our eye, they go round with great rapidity. A microscope, in the same manner, serves to bring our eye close to the object, and thus to enlarge it; and not only increase the magnitude of its parts, but of its motion. Hence, therefore, it would follow, that these organical particles, that are said to constitute the bulk of living nature, are but mere optical illusions; and the system founded on them must, like them, be illusive.

These, and many other objections, have been made to this system; which, instead of enlightening the mind, serve only to show, that too close a pursuit of nature very often leads to uncertainty. Happily, however, for mankind, the most intricate inquiries are generally the most useless. Instead, therefore, of balancing accounts between the sexes, and attempting to ascertain to which the business of generation most properly belongs, it will be more instructive, as well as amusing, to begin with animal nature, from its earliest retirements, and evanescent outlines, and pursue the incipient creature through all its changes in the womb, till it arrives into open day.

The usual distinction of animals, with respect to their manner of generation, has been into the oviparous and viviparous kinds; or in other words, into those that bring forth an egg, which is afterwards hatched into life, and those that bring forth their young alive and perfect. In one of these two ways all animals were supposed to have been produced, and all other kinds of generation were supposed imaginary or erroneous. But later discoveries have taught us to be more cautious in making general conclusions, and have even induced many to doubt whether animal life may not be produced merely from putrefaction.[3]

Indeed the infinite number of creatures that putrid substances seem to give birth to, and the variety of little insects seen floating in liquors, by the microscope, appear to favour this opinion. But however this may be, the former method of classing animals can now by no means be admitted, as we find many animals that are produced neither from the womb nor from the shell, but merely from cuttings; so that to multiply life in some creatures, it is sufficient only to multiply the dissection. This being the simplest method of generation, and that in which life seems to require the smallest preparation for its existence, I will begin with it, and so proceed to the two other kinds, from the meanest to the most elaborate.

The earth-worm, the millipedes, the sea-worm, and many marine insects, may be multiplied by being cut in pieces; but the polypus is noted for its amazing fertility; and from hence it will be proper to take the description. The structure of the polypus may be compared to the finger of a glove, open at one end, and closed at the other. The closed end represents the tail of the polypus, with which it serves to fix itself to any substance it happens to be upon; the open end may be compared to the mouth; and, if we conceive six or eight small strings issuing from this end, we shall have a proper idea of its arms, which it can erect, lengthen, and contract, at pleasure, like the horns of a snail. This creature is very voracious, and makes use of its arms as a fisherman does of his net, to catch and entangle such little animals as happen to come within its reach. It lengthens these arms several inches, keeps them separated from each other, and thus occupies a a large space in the water in which it resides. These arms, when extended, are as fine as threads of silk, and have a most exquisite degree of feeling. If a small worm happens to get within the sphere of their activity, it is quickly entangled by one of these arms, and, soon after, the other arms come to its aid: these all together shortening, the worm is drawn into the animal's mouth, and quickly devoured, colouring the body as it is swallowed. Thus much is necessary to be observed of this animal's method of living, to show that it is not of the vegetable tribe, but a real animal, performing the functions which other animals are found to perform, and endued with powers that many of them are destitute of. But what is most extraordinary, remains yet to be told; for, if examined with a microscope, there are seen several little specks, like buds, that seem to pullulate from different parts of its body; and these soon after appear to be young polypi, and, like the large polypus, begin to cast their little arms about for prey, in the same manner. Whatever they happen to ensnare is devoured, and gives a colour not only to their own bodies, but to that of the parent; so that the same food is digested, and serves for the nourishment of both. The food of the little one passes into the large polypus, and colours its body; and this, in its turn, digests and swallows its food to pass into theirs. In this manner every polypus has a new colony sprouting from its body: and these new ones, even while attached to the parent animal, become parents themselves, having a smaller colony also budding from them; all, at the same time, busily employed in seeking for their prey, and the food of any one of them serving for the nourishment, and circulating through the bodies of all the rest. This society, however, is every hour dissolving; those newly produced are seen at intervals to leave the body of the large polypus, and become, shortly after, the head of a beginning colony themselves.

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[2] Mr. Buffon.

[3] Bonet Consid. p. 100.—The theory of equivocal generation was early exploded by men of science; but about the middle of the 18th century it was again revived. At present the opinion of English physiologists is pretty generally against the theory.—ED.

In this manner the polypus multiplies naturally; but one may take a much readier and shorter way to increase them, and this only by cutting them in pieces. Though cut into thousands of parts, each part still retains its vivacious quality, and each shortly becomes a distinct and a complete polypus; whether cut lengthways, or crossways, it is all the same; this extraordinary creature seems a gainer by our endeavours, and multiplies by apparent destruction. The experiment has been tried, times without number, and still attended with the same success. Here, therefore, naturalists, who have been blamed for the cruelty of their experiments upon living animals, may now boast of their increasing animal life, instead of destroying it. The production of the polypus is a kind of philosophical generation. The famous Sir Thomas Brown hoped one day to be able to produce children by the same method as trees are produced: the polypus is multiplied in this manner; and every philosopher may thus, if he please, boast of a very numerous, though, I should suppose, a very useless progeny.

This method of generation, from cuttings, may be considered as the most simple kind, and is a strong instance of the little pains Nature takes in the formation of her lower and humbler productions. As the removal of these from inanimate into animal existence is but small, there are but few preparations made for their journey. No organs of generation seem provided, no womb to receive, no shell to protect them in their state of transition. The little reptile is quickly fitted for all the offices of its humble sphere, and in a very short time, arrives at the height of its contemptible perfection.

The next generation is of those animals that we see produced from the egg. In this manner all birds, most fishes, and many of the insect tribes, are brought forth. An egg may be considered as a womb detached from the body of the parent animal, in which the embryo is but just beginning to be formed. It may be regarded as a kind of incomplete delivery, in which the animal is disburdened of its young before its perfect formation. Fishes and insects, indeed, most usually commit the care of their eggs to hazard; but birds, which are more perfectly formed, are found to hatch them into maturity by the warmth of their bodies. However, any other heat, of the same temperature, would answer the end as well; for either the warmth of the sun, or of a stove, is equally efficacious in bringing the animal in the egg to perfection.[4] In this respect, therefore, we may consider generation from the egg as inferior to that in which the animal is brought forth alive. Nature has taken care of the viviparous animal in every stage of its existence. That force which separates it from the parent separates it from life; and the embryo is shielded with unceasing protection till it arrives at exclusion. But it is different with the little animal in the egg; often totally neglected by the parent, and always separable from it, every accident may retard its growth, or even destroy its existence. Besides, art or accident, also, may bring this animal to a state of perfection; so that it never can be considered as a complete work of nature, in which so much is left for accident to finish or destroy.

But however inferior this kind of generation may be, the observation of it will afford great insight into that of nobler animals, as we can here watch the progress of the growing embryo in every period of its existence, and catch it in those very moments when it first seems stealing into motion. Malpighi and Haller have been particularly industrious on this subject; and with a patience almost equalling that of the sitting hen, have attended incubation in all its stages. From them, therefore, we have an amazing history of the chicken in the egg, and of its advances into complete formation.

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[4] It is indispensable to hatching, that an equable temperature be kept up of about 96° Fahr. or 32° Réaum., for at lower temperatures the living principle appears to become torpid and unable to assimilate the nourishment provided for developing the embryo. Proceeding upon this principle, the Egyptians, as well as those who have tried the experiment in Europe, have succeeded by means of artificial heat in hatching eggs without any aid from the mother-bird.—Ed.

It would be methodically tedious to describe those parts of the egg which are well known and obvious; such as its shell, its white, and its yolk; but the disposition of these is not so apparent. Immediately under the shell lies that common membrane or skin, which lines it on the inside, adhering closely to it everywhere, except at the broad end, where a little cavity is left, that is filled with air which increases as the animal within grows larger. Under this membrane are contained two whites, though seeming to us to be only one, each wrapped up in a membrane of its own, one white within the other. In the midst of all is the yolk wrapped round likewise in its own membrane. At each end of this are two ligaments, called *chalazæ*, which are, as it were, the poles of this microcosm, being white dense substances, made from the membranes, and serving to keep the white and the yolk in their places. It was the opinion of Mr. Derham that they served also for another purpose; for a line being drawn from one ligament to the other, would not pass directly through the middle of the yolk, but rather towards one side, and would divide the yolk into two unequal parts, by which means these ligaments serve to keep the smallest side of the yolk always uppermost; and in this part he supposed the cicatricula, or first speck of life, to reside; which by being uppermost, and consequently next the hen, would be thus in the warmest situation. But this is rather fanciful than true, the incipient animal being found in all situations, and not particularly influenced by any.[5] This cicatricula, which is the part where the animal first begins to show signs of life, is not unlike a vetch, or a lentil, lying on one side of the yolk, and within its membrane. All these contribute to the little animal's convenience or support: the outer membranes and ligaments preserve the fluids in their proper places; the white serves as nourishment; and the yolk, with its membranes, after a time becomes a part of the animal's body.[6] This is the description of a hen's egg, and answers to that of all others, how large or how small soever.

Previous to putting the eggs to the hen, our philosophers first examined the cicatricula, or little spot, already mentioned; and which may be considered as the most important part of the egg. This was found in those that were impregnated by the cock to be large: but in those laid without the cock, very small. It was found by the microscope, to be a kind of bag, containing a transparent liquor, in the midst of which the embryo was seen to reside. The embryo resembled a composition of little threads, which the warmth of future incubation tended to enlarge by varying and liquefying the other fluids contained within the shell, and thus pressing them either into the pores or tubes of their substance.

Upon placing the eggs in a proper warmth,[7] either under the sun or in a stove, after six hours the vital speck begins to dilate, like the pupil of the eye. The head of the chicken is distinctly seen, with the back-bone, something resembling a tadpole, floating in its ambient fluid, but as yet seeming to assume none of the functions of animal life. In about six hours more the little animal is seen more distinctly; the head becomes more plainly visible, and the vertebræ of the back more easily perceivable. All these signs of preparation for life are increased in six hours more; and at the end of twenty-four hours, the ribs begin to take their places, the neck begins to lengthen, and the head to turn to one side.

At this time,[8] also, the fluids in the egg seem to have changed place; the yolk, which was before in the centre of the shell, approaches nearer to the broad end. The watery part of the white is in some measure evaporated through the shell, and the grosser part sinks to the small end. The little animal appears to turn towards the part of the broad end, in which a cavity has been described, and with its yolk seems to adhere to the membrane there. At the end of forty hours the great work of life seems fairly begun, and the animal plainly appears to move; the back-bone, which is of a whitish colour, thickens; the head is turned still more on one side; the first rudiments of the eyes begin to appear, the heart beats, and the blood begins already to circulate. The parts, however, as yet are fluid, but by degrees become more and more tenacious, and harden into a kind of jelly. At the end of two days, the liquor in which the chicken swims, seems to increase; the head appears with two little bladders, in the place of eyes; the heart beats in the manner of every embryo, where the blood does not circulate through the lungs. In about fourteen hours after this, the chicken is grown more strong; its head however is still bent downwards; the veins and the arteries begin to branch, in order to form the brain; and the spinal marrow is seen stretching along the back-bone. In three days the whole body of the chicken appears bent; the head, with its two eye-balls, with their different humours, now distinctly appear; and five other vesicles are seen, which soon unite to form the rudiments of the brain. The outlines also of the thighs and wings begin to be seen, and the body begins to gather flesh. At the end of the fourth day, the vesicles, that go to form the brain, approach each other; the wings and thighs appear more solid; the whole body is covered with a jelly-like flesh; the heart that was hitherto exposed, is now covered up within the body, by a very thin transparent membrane; and, at the same time, the umbilical vessels, that

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[5] Haller.

[6] Ibid.

[7] Malpighi.

[8] Harvey.

e animal to the yolk, now appear to come
om the abdomen. After the fifth and
ys, the vessels of the brain begin to be
over; the wings and thighs lengthen;
is closed up and tumid; the liver is seen
it very distinctly, not yet grown red, but
dusky white; both the ventricles of the
discerned, as if they were two separate
eating distinctly; the whole body of the
is covered over; and the traces of the
t feathers are already to be seen. The
day, the head appears very large; the
covered entirely over; the bill begins to
betwixt the eyes; and the wings, the
nd the legs, have acquired their perfect
Hitherto, however, the animal appears
ad two bodies; the yolk is joined to it
mbilical vessels that come from the belly,
rnished with its vessels, through which
d circulates, as through the rest of the
the chicken, making a bulk greater
at of the animal itself. But towards
of incubation, the umbilical vessels
the yolk, and with it the intestines are
p into the body of the chicken by the
the muscles of the belly; and the two
re thus formed into one. During this
the organs are found to perform their
s; the bile is found to be separated as
animals; but it is fluid, transparent,
out bitterness: and the chicken then
ears to have lungs. On the tenth the
of the wings appear, and the feathers
push out. On the eleventh, the heart,
itherto had appeared divided, begins to
he arteries which belong to it join into
the fingers into the palm of the hand.
appearances only come more into view,
the fluids the vessels had hitherto secreted
re transparent; but as the colour of the
pens, their operations and circulations
e distinctly seen. As the animal thus,
leventh day completely formed, begins
r strength, it becomes more uneasy in
tion, and exerts its animal powers with
g force. For some time before it is able
the shell in which it is imprisoned, it
to chirrup, receiving a sufficient quan-
air for this purpose, from that cavity
es between the membrane and the shell,
ch must contain air to resist the exter-
ure. At length upon the twentieth day,
birds sooner, and later in others, the en-
imal breaks the shell, within which it
confined, with its beak; and by repeat-
s, at last procures its enlargement.

this little history we perceive, that those
ich are most conducive to life are the
are begun; the head and the back-bone,
doubt enclose the brain and the spinal-
though both are too limpid to be discerned, are the first that are seen to exist: the beating of the heart is perceived soon after: the less noble parts seem to spring from these; the wings, the thighs, the feet, and lastly the bill Whatever, therefore, the animal has double, or whatever it can live without the use of, these are latest in production; Nature first sedulously applying to the formation of the nobler organs, without which life would be of short continuance, and would be begun in vain.

The resemblance between the beginning animal in the egg, and the embryo in the womb, is very striking; and this similitude has induced many to assert, that all animals are produced from eggs in the same manner. They consider an egg excluded from the body by some, and separated into the womb by others, to be actions merely of one kind; with this only difference, that the nourishment of the one is kept within the body of the parent, and increases as the embryo happens to want the supply; the nourishment of the other is prepared all at once, and sent out with the beginning animal, as entirely sufficient for its future support. But leaving this to the discussion of anatomists, let us proceed rather with facts than dissertations; and, as we have seen the progress of an oviparous animal, or one produced from the shell, let us likewise trace that of a viviparous animal, which is brought forth alive. In this investigation, Graaf has, with a degree of patience characteristic of his nation, attended the progress and increase of various animals in the womb, and minutely marked the changes they undergo. Having dissected a rabbit, half-an-hour after impregnation, he perceived the horns of the womb, that go to embrace and communicate with the ovary, to be more red than before; but no other change in the rest of the parts. Having dissected another six hours after, he perceived the follicules, or the membrane covering the eggs contained in the ovary, to become reddish. In a rabbit dissected after twenty-four hours, he perceived in one of the ovaries, three follicules, and in the other, five, that were changed; having become, from transparent, dark and reddish. In one dissected after three days, he perceived the horns of the womb very strictly to embrace the ovaries; and he observed three of the follicules in one of them, much longer and harder than before; pursuing his inquisition, he also found two of the eggs actually separated into the horns of the womb, and each about the size of a grain of mustard-seed; these little eggs were each of them enclosed in a double membrane, the inner parts being filled with a very limpid liquor. After four days, he found in one of the ovaries four, and, in the other, five follicules, emptied of their eggs; and, in the horns correspondent to these, he found an equal number of eggs thus separated: these eggs were now grown larger than before, and somewhat of the size of sparrow-shot. In five days, the eggs were grown to the size of duck-shot, and could

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[9] Haller.

be blown from the part of the womb where they were, by the breath. In seven days, these eggs were found of the size of a pistol-bullet, each covered with its double membrane, and these much more distinct than before. In nine days, having examined the liquor contained in one of these eggs, he found it from a limpid colour less fluid, to have got a light cloud floating upon it. In ten days, this cloud began to thicken, and to form an oblong body, of the figure of a little worm: and, in twelve days, the figure of the embryo was distinctly to be perceived, and even its parts came into view. In the region of the breast he perceived two bloody specks; and two more that appeared whitish. Fourteen days after impregnation, the head of the embryo was become large and transparent, the eyes prominent, the mouth open, and the rudiments of the ears beginning to appear; the back-bone, of a whitish colour, was bent towards the breast; the two bloody specks being now considerably increased, appeared to be nothing less than the outlines of the two ventricles of the heart; and the two whitish specks on each side, now appeared to be the rudiments of the lungs; towards the region of the belly, the liver began to be seen, of a reddish colour, and a little intricate mass, like ravelled thread, discerned, which soon appeared to be the stomach and the intestines; the legs soon after began to be seen, and to assume their natural positions: and from that time forth, all the parts being formed, every day only served to develop them still more, until the thirty-first day, when the rabbit brought forth her young, completely fitted for the purposes of their humble happiness.

Having thus seen the stages of generation in the meaner animals, let us take a view of its progress in man; and trace the feeble beginnings of our own existence. An account of the lowliness of our own origin, if it cannot amuse, will at least serve to humble us; and it may take from our pride, though it fails to gratify our curiosity. We cannot here trace the variations of the beginning animal, as in the former instances; for the opportunities of inspection are but few and accidental: for this reason, we must be content often to fill up the blanks of our history with conjecture. And, first, we are entirely ignorant of the state of the infant in the womb, immediately after conception; but we have good reason to believe, that it proceeds, as in most other animals, from the egg.[10] Anatomists inform us, that four days after conception, there is found in the womb an oval substance, about the size of a small pea, but longer one way than the other; this little body is formed by an extremely fine membrane, enclosing a liquor a good deal resembling the white of an egg: in this may, even then, be perceived several small fibres, united together, which form the first rudiments of the embryo. Beside these, are seen another set of fibres, which soon after become the placenta, or that body by which the animal is supplied with nourishment.

Seven days after conception, we can readily distinguish by the eye, the first lineaments of the child in the womb. However, they are as yet without form; showing at the end of seven days pretty much such an appearance as that of the chicken after four and twenty hours, being a small jelly-like mass, yet exhibiting the rudiments of the head; the trunk is barely visible: there likewise is to be discerned a small assemblage of fibres issuing from the body of the infant, which afterwards become the blood-vessels that convey nourishment from the placenta to the child, while enclosed in the womb.

Fifteen days after conception, the head becomes distinctly visible, and even the most prominent features of the visage begin to appear. The nose is a little elevated: there are two black specks in the place of eyes; and two little holes where the ears are afterwards seen. The body of the embryo also is grown larger; and both above and below, are seen two little protuberances, which mark the places from whence the arms and thighs are to proceed. The length of the whole body at this time is less than half-an-inch.

At the end of three weeks, the body has received very little increase; but the legs and feet, with the hands and arms, are become apparent. The growth of the arms is more speedy than that of the legs; and the fingers are sooner separated than the toes. About this time the internal parts are found, upon dissection, to become distinguishable. The places of the bones are marked by small thread-like substances, that are yet more fluid even than a jelly. Among them, the ribs are distinguishable, like threads also, disposed on each side of the spine; and even the fingers and toes scarcely exceed hairs in thickness.

In a month, the embryo is an inch long; the body is bent forward, a situation which it almost always assumes in the womb, either because a posture of this kind is the most easy, or because it takes up the least room. The human figure is now no longer doubtful: every part of the face is distinguishable; the body is sketched out; the bowels are to be distinguished as threads; the bones are still quite soft, but in some places beginning to assume a greater rigidity; the blood-vessels that go to the placenta, which, as was said, contributes to the child's nourishment, are plainly seen issuing from the navel (being therefore called the *umbilical vessels*), and going to spread themselves upon the placenta. According to Hippocrates, the male embryo develop sooner than the female: he adds, that at the end of thirty days, the parts of the body of the male are distinguishable; while those of the female are not equally so till ten days after.

In six weeks, the embryo is grown two inches long; the human figure begins to grow every day more perfect; the head being still much larger, in proportion to the rest of the body; and the motion of the heart is perceived almost by the eye It has been seen to beat in an embryo of fifty days old, a long time after it had been taken out of the womb.

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[10] This history of the child in the womb is translated from Mr. Buffon with some alterations.

In two months, the embryo is more than two inches in length. The ossification is perceivable in the arms and thighs, and in the point of the chin, the under jaw being greatly advanced before the upper. These parts, however, may as yet be considered as bony points, rather than as bones. The umbilical vessels, which before went side by side, are now begun to be twisted, like a rope, one over the other, and go to join with the placenta, which as yet is but small.

In three months, the embryo is above three inches long, and weighs about three ounces. Hippocrates observes, that not till then the mother perceives the child's motion: and he adds, that in female children, the motion is not observable till the end of four months. However, this is no general rule, as there are women who assert, that they perceived themselves to be quick with child, as their expression is, at the end of two months; so that this quickness seems rather to arise from the proportion between the child's strength and the mother's sensibility, than from any determinate period of time. At all times, however, the child is equally alive; and, consequently, those juries of matrons that are to determine upon the pregnancy of criminals, should not inquire whether the woman be quick, but whether she be with child; if the latter be perceivable, the former follows of course.

Four months and a-half after conception, the embryo is from six to seven inches long. All the parts are so augmented, that even their proportions are now distinguishable. The very nails begin to appear upon the fingers and toes: and the stomach and intestines already begin to perform their functions of receiving and digesting. In the stomach is found a liquor similar to that in which the embryo floats: in one part of the intestines, a milky substance; and, in the other, an excrementitious. There is found, also, a small quantity of bile in the gall bladder; and some urine in its own proper receptacle. By this time, also, the posture of the embryo seems to be determined. The head is bent forward, so that the chin seems to rest upon its breast; the knees are raised up toward the head, and the legs bent backward, somewhat resembling the posture of those who sit on their haunches. Sometimes the knees are raised so high as to touch the cheeks, and the feet are crossed over each other; the arms are laid upon the breast, while one of the hands, and often both, touch the visage; sometimes the hands are shut, and sometimes also the arms are found hanging down by the body. These are the most usual postures which the embryo assumes; but these it is frequently known to change; and it is owing to these alterations that the mother so frequently feels those twitches, which are usually attended with pain.

The embryo, thus situated, is furnished by nature with all things proper for its support; and, as it increases in size, its nourishment also is found to increase with it. As soon as it first begins to grow in the womb, that receptacle, from being very small, grows larger; and, what is more surprising, thicker every day. The sides of a bladder, as we know, the more they are distended, the more they become thin. But here the larger the womb grows, the more it appears to thicken. Within this the embryo is still farther involved, in two membranes called the *chorion* and *amnios;* and floats in a thin transparent fluid, upon which it seems in some measure to subsist. However, the great storehouse, from whence its chief nourishment is supplied, is called the *placenta;* a red substance somewhat resembling a sponge, that adheres to the inside of the womb, and communicates, by the umbilical vessels, with the embryo. These umbilical vessels, which consist of a vein and two arteries, issue from the navel of the child, and are branched out upon the placenta; where they, in fact, seem to form its substance; and, if I may so express it, to suck up their nourishment from the womb, and the fluids contained therein. The blood thus received from the womb, by the placenta, and communicated by the umbilical vein to the body of the embryo, is conveyed to the heart; where, without ever passing into the lungs, as in the born infant, it takes a shorter course; for, entering the right auricle of the heart, instead of passing up into the pulmonary artery, it seems to break this partition, and goes directly through the body of the heart, by an opening called the *foramen ovale,* and from thence to the aorta; by which it is driven into all parts of the body. Thus we see the placenta, in some measure, supplying the place of lungs; for as the little animal can receive no air by inspiration, the lungs are therefore useless. But we see the placenta converting the fluid of the womb into blood, and sending it, by the umbilical vein, to the heart, from whence it is despatched by a quicker and shorter circulation through the whole frame.

In this manner the embryo reposes in the womb; supplied with that nourishment which is fitted to its necessities, and furnished with those organs that are adapted to its situation. As its sensations are but few, its wants are in the same proportion; and it is probable that a sleep, with scarcely any intervals, marks the earliest period of animal life. As the little creature, however, gathers strength and size, it seems to become more wakeful and uneasy; even in the womb it begins to feel the want of something it does not possess; a sensation that seems coeval with man's nature, and never leaves him till he dies. The embryo even then begins to struggle for a state more marked by pleasure and pain, and, from about the sixth month, begins to give the mother warning of the greater pain she is yet to endure. The continuation of pregnancy, in woman, is usually nine months; but there have been many instances when the child has lived that was born at seven; and some are found to continue pregnant a month above the usual time. When the appointed time approaches, the infant, that has for some months been giving painful proofs of its existence, now begins to increase its efforts for liberty. The head is applied downward, to the aperture of the womb, and by reiterated efforts it endeavours to extend the same: these endeavours produce the pain, which all women, in labour, feel in some degree; those of strong constitutions the least, those most weakly the most severely; since we learn, that the women of Africa always deliver themselves, and are well a few hours after; while those of Europe require assistance, and recover more slowly. Thus the infant, still continuing to push with its head forward, by the repetition of its endeavours, at last succeeds, and issues into life. The blood which had hitherto passed through the heart, now takes a wider circuit; and the foramen ovale closes; the lungs, that had till this time been inactive, now first begin their functions; the air rushes in to distend them; and this produces the first sensation of pain, which the infant expresses by a shriek: so that the beginning of our lives, as well as the end, is marked with anguish.[11]

From comparing these accounts, we perceive that the most laboured generation is the most perfect; and that the animal, which, in proportion to its bulk, takes the longest time for production, is always the most complete when finished. Of all others, man seems the slowest in coming into life, as he is the slowest in coming to perfection; other animals, of the same bulk, seldom remain in the womb above six months, while he continues nine; and even after his birth, appears more than any other to have his state of imbecility prolonged.

We may observe also, that that generation is the most complete, in which the fewest animals are produced: Nature, by attending to the production of one at a time, seems to exert all her efforts in bringing it to perfection; but, where this attention is divided, the animals so produced come into the world with partial advantages. In this manner twins are never, at least while infants, so large or so strong, as those that come singly into the world; each having, in some measure, robbed the other of its right; as that support, which Nature meant for one, has been prodigally divided.

In this manner, as those animals are the best that are produced singly, so we find that the noblest animals are ever the least fruitful. These are seen usually to bring forth but one at a time, and to place all their attention upon that alone. On the other hand, all the oviparous kinds produce in amazing plenty; and even the lower tribes of viviparous animals increase in a seeming proportion to their minuteness and imperfection. Nature seems lavish of life in the lower orders of the creation; and, as if she meant them entirely for the use of the nobler races, she appears to have bestowed greater pains in multiplying the number than in completing the kind. In this manner, while the elephant and the horse bring forth but one at a time, the spider and the beetle are seen to produce a thousand: and even among the smaller quadrupeds, all the inferior kinds are extremely fertile; any one of these being found, in a very few months, to become the parent of a numerous progeny.

In this manner, therefore, the smallest animals multiply in the greatest proportion; and we have reason to thank Providence that the most formidable animals are the least fruitful. Had the lion and the tiger the same degree of fecundity with the rabbit or the rat, all the arts of man would be unable to oppose these fierce invaders; and we should soon perceive them become the tyrants of those who claim the lordship of the creation. But Heaven, in this respect, has wisely consulted the advantage of all. It has opposed to man only such enemies as he has art and strength to conquer; and as large animals require proportional supplies, nature was unwilling to give new life, where it, in some measure, denied the necessary means of subsistence.

In consequence of this pre-established order the animals that are endowed with the most perfect methods of generation, and bring forth but one at a time, seldom begin to procreate till they have almost acquired their full growth. On the other hand, those which bring forth many, engender before they have arrived at half their natural size. The horse and the bull come almost to perfection before they begin to generate; the hog and the rabbit scarcely leave the teat before they become parents themselves.[12] In whatever light, therefore, we consider this subject, we shall find that all creatures approach most to perfection, whose generation most nearly resembles that of man. The reptile produced from cutting is but one degree above the vegetable. The animal produced from the egg is a step higher in the scale of existence; that class of animals which are brought forth alive, are still more exalted. Of these, such as bring forth one at a time are the most complete: and foremost of these stands Man, *the great master of all*, who seems to have united the perfections of all the rest in his formation.

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[11] Bonet Contemplat. de la Nature, vol. i. p. 212.

[12] See Note on the periods of reproduction in different animals, chap. xv. of this book.—ED.

CHAP. III.

THE INFANCY OF MAN.

When we take a survey of the various classes of animals, and examine their strength, their beauty, or their structure, we shall find man to possess most of those advantages united, which the rest enjoy partially. Infinitely superior to all others in the powers of the understanding, he is also superior to them in the fitness and proportions of his form. He would, indeed, have been one of the most miserable beings upon earth, if with a sentient mind he was so formed as to be incapable of obeying its impulse; but Nature has otherwise provided; as with the most extensive intellects to command, she has furnished him with a body the best fitted for obedience.

In infancy,[1] however, that mind and this body form the most helpless union in all animated nature; and, if anything can give us a picture of complete imbecility, it is a man when just come into the world. The infant just born stands in need of all things without the power of procuring any. The lower races of animals, upon being produced, are active, vigorous, and capable of self-support; but the infant is obliged to wait in helpless expectation; and its cries are its only aid to procure subsistence.

An infant just born may be said to come from one element into another: for, from the watery fluid in which it was surrounded, it now immerges into air; and its first cries seem to imply how greatly it regrets the change. How much longer it could have continued in a state of almost total insensibility in the womb, is impossible to tell: but it is very probable that it could remain there some hours more. In order to throw some light upon this subject, Mr. Buffon so placed a pregnant bitch, as that her puppies were brought forth in warm water, in which he kept them above half-an-hour at a time. However, he saw no change in the animals, thus newly brought forth; they continued the whole time vigorous; and, during the whole time, it is very probable that the blood circulated through the same channels through which it passed while they continued in the womb.

Almost all animals have their eyes closed,[2] for some days after being brought into the world. The infant opens them the instant of its birth. However, it seems to keep them fixed and idle; they want that lustre which they acquire by degrees; and if they happen to move, it is rather an accidental gaze, than an exertion of the act of seeing. The light alone seems to make the greatest impression upon them. The eyes of infants are sometimes found turned to the place where it is strongest; and the pupil is seen to dilate and diminish, as in grown persons, in proportion to the quantity it receives. But still the infant is incapable of distinguishing objects; the sense of seeing, like the rest of the senses, requires a habit before it becomes any way serviceable. All the senses must be compared with each other, and must be made to correct the defects of one another, before they can give just information. It is probable, therefore, that if the infant could express its own sensations, it would give a very extraordinary description of the illusions which it suffers from them. The sight might, perhaps, be represented as inverting objects, or multiplying them; the hearing, instead of conveying one uniform tone, might be said to bring up an interrupted succession of noises; and the touch apparently would divide one body into as many as there are fingers that grasp it. But all these errors are lost in one confused idea of existence; and it is happy for the infant that it then can make but very little use of its senses, when they could serve only to bring it false information.

If there be any distinct sensations, those of pain seem to be much more frequent and stronger than those of pleasure. The infant's cries are sufficient indications of the uneasiness it must, at every interval, endure; while, in the beginning, it has got no external marks to testify its satisfactions. It is not till after forty days that it is seen to smile; and not till that time also, that tears begin to appear, its former expressions of uneasiness being always without them. As to any other marks of the passions, the infant being as yet almost without them, it can express none of them in its visage; which, except in the act of crying and laughing, is fixed in a settled serenity. All the other parts of the body seem equally relaxed and feeble: its motions are uncertain and its postures without choice; it is unable to stand upright; its hams are yet bent, from the habit which it received from its position in the womb; it has not strength enough in its arms to stretch them forward, much less to grasp anything with its hands; it rests just in the posture it is laid; and, if abandoned, must continue in the same position.

Nevertheless, though this be the description of infancy among mankind in general, there are countries and races among whom infancy does not seem marked with such utter imbecility, but where the children, not long after they are born, appear possessed of a greater share of self-support. The children of Negroes have a surprising degree of this premature industry; they are able to walk at two months; or, at least, to move from one place to another: they also hang to the mother's back without assistance, and seize the breast over her shoulder; continuing in this posture till she thinks proper to lay them down. This is very different in the children of our countries, that seldom are able to walk under a twelvemonth.

The skin of children newly brought forth, is always red, proceeding from its transparency, by which the blood beneath appears more conspi

[1] Buffon, vol. iv. p. 173.

[2] Ibid.

cuous. Some say that this redness is greatest in those children that are afterwards about to have the finest complexions; and it appears reasonable that it should be so, since the thinnest skins are always the fairest. The size of a new-born infant is generally about twenty inches, and its weight about twelve pounds. The head is large, and all the members delicate, soft, and puffy. These appearances alter with its age; as it grows older, the head becomes less in proportion to the rest of the body; the flesh hardens; the bones, that before birth grew very thick in proportion, now lengthen by degrees, and the human figure more and more acquires its due dimensions. In such children, however, as are but feeble or sickly, the head always continues too big for the body; the heads of dwarfs being extremely large in proportion.

Infants, when newly born, pass most of their time in sleeping, and awake with crying; excited either by sensations of pain or of hunger. Man, when come to maturity, but rarely feels the want of food, as eating twice or thrice in the four and twenty hours is known to suffice the most voracious: but the infant may be considered as a little glutton, whose only pleasure consists in its appetite; and this, except when it sleeps, it is never easy without satisfying. Thus nature has adapted different desires to the different periods of life; each as it seems most necessary for human support or succession. While the animal is yet forming, hunger excites it to that supply which is necessary for its growth; when it is completely formed, a different appetite takes place, that incites it to communicate existence. These two desires take up the whole attention of different periods, but are very seldom found to prevail strongly together in the same age; one pleasure ever serving to repress the other: and, if we find a person of full age placing a principal part of his happiness in the nature and quantity of his food, we have strong reasons to suspect, that with respect to his other appetites he still retains a part of the imbecility of his childhood.

It is extraordinary, however, that infants, who are thus more voracious than grown persons, are nevertheless more capable of sustaining hunger. We have several instances, in accidental cases of famine, in which the child has been known to survive the parent, and seen clinging to the breast of its dead mother. Their little bodies also are more patient of cold; and we have similar instances of the mother's perishing in the snow, while the infant has been found alive beside her. However, if we examine the internal structure of infants, we shall find an obvious reason for both these advantages. Their blood-vessels are known to be much larger than in adults; and their nerves much thicker and softer: thus being furnished with a more copious quantity of juices, both of the nervous and sanguinary kinds, the infant finds a temporary sustenance in this superfluity, and does not expire till both are exhausted. The circulation also being larger and quicker, supplies it with proportionable warmth, so that it is more capable of resisting the accidental rigours of the weather.

The first nourishment of infants is well known to be the mother's milk; and what is remarkable, the infant has milk in its own breasts, which may be squeezed out by compression; this nourishment becomes less grateful as the child gathers strength; and perhaps, also, more unwholesome. However, in cold countries, which are unfavourable to propagation, and where the female has seldom above three or four children at the most, during her life, she continues to suckle the child for four or five years together. In this manner the mothers of Canada and Greenland are often seen suckling two or three children, of different ages, at a time.

The life of infants is very precarious till the age of three or four, from which time it becomes more secure; and when a child arrives at its seventh year it is then considered as a more certain life, as Mr. Buffon asserts, than at any other age whatever. It appears from Simpson's Tables, that of a certain number of children born at the same time, a fourth part are found dead at the end of the first year; more than one-third at the end of the second; and, at least, half at the end of the third: so that those who live to be above three years old, are indulged a longer term than half the rest of their fellow-creatures. Nevertheless, life, at that period, may be considered as mere animal existence; and rather a preparation for, than an enjoyment of, those satisfactions, both of mind and body, that make life of real value: and hence it is more natural for mankind to deplore a fellow-creature, cut off in the bloom of life, than one dying in early infancy. The one, by living up to youth, and thus wading through the disadvantageous parts of existence, seems to have earned a short continuance of its enjoyments: the infant, on the contrary, has served but a short apprenticeship to pain; and when taken away, may be considered as rescued from a long continuance of misery.

There is something very remarkable in the growth of the human body.[3] The embryo in the womb continues to increase still more and more till it is born. On the other hand, the child's growth is less every year till the time of puberty, when it seems to start up of a sudden. Thus, for instance, the embryo, which is an inch long in the first month, grows but one inch and a quarter in the second; it then grows one and a half in the third; two and a half in the fourth; and in this manner it keeps increasing till in the last month of its continuance it is actually found to grow four inches; and in the whole about eighteen inches long. But it is otherwise with the child when born: if we suppose it eighteen inches at that time, it grows in the first year six or seven inches; in the second year, it grows but four inches; in the third year about three; and so on, at the rate of about an inch and a half, or two inches each year, till the time of puberty, when nature seems to make one great last effort, to complete her work, and unfold the whole animal machine.

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[3] Buffon, vol. iv. p. 173.

The growth of the mind in children seems to correspond with that of the body. The comparative progress of the understanding is greater in infants than in children of three or four years old. If we only reflect a moment on the amazing acquisitions that an infant makes in the first and second years of life, we shall have much cause for wonder. Being sent into a world where every thing is new and unknown, the first months of life are spent in a kind of torpid amazement; an attention distracted by the multiplicity of objects that press to be known. The first labour, therefore, of the little learner is, to correct the illusions of the senses, to distinguish one object from another, and to exert the memory, so as to know them again. In this manner a child of a year old has already made a thousand experiments; all which it has properly ranged, and distinctly remembers. Light, heat, fire, sweets, and bitters, sounds soft or terrible, are all distinguished at the end of a very few months. Besides this, every person the child knows, every individual object it becomes fond of, its rattles, or its bells, may be all considered as so many new lessons to the young mind, with which it has not become acquainted, without repeated exertions of the understanding. At this period of life, the knowledge of every individual object cannot be acquired without the same effort which, when grown up, is employed upon the most abstract idea; every thing the child hears or sees, all the marks and characters of nature, are as much unknown, and require the same attention to attain, as if the reader were set to understand the characters of an Ethiopic manuscript; and yet we see in how short a time the little student begins to understand them all, and to give evident marks of early industry.

It is very amusing to pursue the young mind, while employed in its first attainments. At about a year old the same necessities that first engaged its faculties, increase as its acquaintance with nature enlarges. Its studies, therefore, if I may use the expression, are no way relaxed; for having experienced what gave pleasure at one time, it desires a repetition of it from the same object; and in order to obtain this, that object must be pointed out; here therefore, a new necessity arises, which, very often, neither its little arts nor importunities can remove; so that the child is at last obliged to set about naming the objects it desires to possess or avoid. In beginning to speak, which is usually about a year old, children find a thousand difficulties. It is not without repeated trials that they come to pronounce any one of the letters; nor without an effort of the memory, that they can retain them. For this reason, we frequently see them attempting a sound which they had learned, but forgot; and when they have failed, I have often seen their attempt attended with apparent confusion. The letters soonest learned, are those which are most easily formed; thus A and B require an obvious disposition of the organs, and their pronunciation is consequently soon attained. Z and R, which require a more complicated position, are learned with greater difficulty. And this may, perhaps, be the reason why the children in some countries speak sooner than in others; for the letters mostly occurring in the language of one country, being such as are of easy pronunciation, that language is of course more easily attained. In this manner the children of the Italians are said to speak sooner than those of the Germans, the language of the one being smooth and open: that of the other, crowded with consonants, and extremely guttural.

But be this as it will, in all countries children are found able to express the greatest part of their wants by the time they arrive at two years old; and from the moment the necessity of learning new words ceases, they relax their industry. It is then that the mind, like the body, seems every year to make slow advances; and, in order to spur up attention, many systems of education have been contrived.

Almost every philosopher, who has written on the education of children, has been willing to point out a method of his own, chiefly professing to advance the health, and improve the intellects at the same time. These are usually found to begin with finding nothing right in the common practice; and by urging a total reformation. In consequence of this, nothing can be more wild or imaginary than their various systems of improvement. Some will have the children every day plunged in cold water, in order to strengthen their bodies; they will have them converse with the servants in nothing but the Latin language, in order to strengthen their minds; every hour of the day must be appointed for its own studies, and the child must learn to make these very studies an amusement; till about the age of ten or eleven it becomes a prodigy of premature improvement. Quite opposite to this, we have others, whom the courtesy of mankind also calls *philosophers;* and they will have the child learn nothing till the age of ten or eleven, at which the former has attained so much perfection; with them the mind is to be kept empty, until it has a proper distinction of some metaphysical ideas about truth; and the promising pupil is debarred the use of even his own faculties, lest they should conduct him into prejudice and error. In this manner, some men, whom fashion has celebrated for profound and fine thinkers, have given their hazarded and untried conjectures, upon one of the most important subjects in the world, and the most interesting to humanity. When men speculate at liberty upon innate ideas, or the abstracted distinctions between will and power, they may be permitted to enjoy their systems at pleasure, as they are harmless, although they may be wrong; but when they allege that children are to be every day plunged in cold water, and, whatever be their constitution, indiscriminately inured to cold and moisture; that they are to be kept wet in the feet, to prevent their catching cold; and never to be corrected when young, for fear of breaking their spirits when old; these are such noxious errors, that all reasonable men should endeavour to oppose them. Many have been the children whom these opinions, begun in speculation, have injured or destroyed in practice; and I have seen many a little philosophical martyr, whom I wished, but was unable to relieve.

If any system be therefore necessary, it is one that would serve to show a very plain point; that very little system is necessary. The natural and common course of education is in every respect the best; I mean that in which the child is permitted to play among its little equals, from whose similar instructions it often gains the most useful stores of knowledge. A child is not idle because it is playing about the fields, or pursuing a butterfly; it is all this time storing its mind with objects, upon the nature, the properties, and the relations of which, future curiosity may speculate.

I have ever found it a vain task to try to make a child's learning its amusement; nor do I see what good end it would answer, were it actually attained. The child, as was said, ought to have its share of play, and it will be benefited thereby; and for every reason also it ought to have its share of labour. The mind, by early labour, will be thus accustomed to fatigues and subordination; and whatever be the person's future employment in life, he will be better fitted to endure it: he will be thus enabled to support the drudgeries of office with content; or to fill up the vacancies of life with variety. The child, therefore, should by times be put to its duty; and be taught to know, that the task is to be done, or the punishment to be endured. I do not object against alluring it to duty by reward; but we well know, that the mind will be more strongly stimulated by pain; and both may, upon some occasions, take their turn to operate. In this manner, a child, by playing with its equals abroad, and labouring with them at school, will acquire more health and knowledge, than by being bred up under the wing of any speculative system-maker; and will be thus qualified for a life of activity and obedience. It is true, indeed, that when educated in this manner, the boy may not be so seemingly sensible and forward as one bred up under solitary instruction; and, perhaps, this early forwardness is more engaging than useful. It is well known, that many of those children who have been such prodigies of literature before ten, have not made an adequate progress to twenty. It should seem, that they only began learning manly things before their time; and, while others were busied in picking up that knowledge adapted to their age and curiosity, these were forced upon subjects unsuited to their years; and, upon that account alone, appearing extraordinary. The stock of knowledge in both may be equal; but with this difference, that each is yet to learn what the other knows.

But whatever may have been the acquisitions of children at ten or twelve, their greatest, and most rapid progress, is made when they arrive near the age of puberty. It is then that all the powers of nature seem at work in strengthening the mind and completing the body; the youth acquires courage, and the virgin modesty; the mind, with new sensations, assumes new powers; it conceives with greater force, and remembers with greater tenacity. About this time, therefore, which is various in different countries, more is learned in one year than in any two of the preceding; and on this age, in particular, the greatest weight of instruction ought to be thrown.

CHAP. IV.

OF PUBERTY.

It has been often said, that the season of youth is the season of pleasures; but this can only be true in savage countries, where but little preparation is made for the perfection of human nature; and where the mind has but a very small part in the enjoyment. It is otherwise in those places where nature is carried to the highest pitch of refinement, in which this season of the greatest sensual delight is wisely made subservient to the succeeding and more rational one of manhood. Youth with us is but a scene of preparation; a drama, upon the right conduct of which all future happiness is to depend. The youth who follows his appetites too soon, seizes the cup before it has received its best ingredients; and, by anticipating his pleasures, robs the remaining parts of life of their share; so that his eagerness only produces a manhood of imbecility, and an age of pain.

The time of puberty is different in various countries, and always more late in men than in women. In the warm countries of India, the women are marriageable at nine or ten, and the men at twelve or thirteen. It is also different in cities where the inhabitants lead a more soft luxurious life, from the country, where they work harder, and fare less delicately. Its symptoms are seldom alike in different persons, but it is usually known by a swelling of the breasts in one sex, and a roughness of the voice in the other. At this season, also, the women seem to acquire iew beauty, while the men lose all that delicate ffeminacy of countenance which they had when oys.

All countries, in proportion as they are civilized r barbarous, improve or degrade the nuptial atisfaction. In those miserable regions, where trength makes the only law, the stronger sex xerts its power, and becomes the tyrant over he weaker: while the inhabitant of Negroland indolent taking his pleasure in the fields, his ife is obliged to till the ground that serves for heir mutual support. It is thus in all barbarous ountries, where the men throw all the laborious uties of life upon the women; and, regardless f beauty, put the softer sex to those employients that must effectually destroy it.

But, in countries that are half barbarous, paricularly wherever Mahometanism prevails, the ien run into the very opposite extreme. Equally rutal with the former, they exert their tyranny ver the weaker sex, and consider that half of he human creation as merely made to be subserient to the depraved desires of the other. The hief, and, indeed, the only aim of an Asiatic, is be possessed of many women; and to be able furnish a seraglio is the only tendency of his mbition. As the savage was totally regardless f beauty, he on the contrary prizes it too highly; e excludes the person who is possessed of such ersonal attractions from any share in the duties r employments of life; and, as if willing to ngross all beauty to himself, increases the numer of his captives in proportion to the progress f his fortune. In this manner he vainly expects augment his satisfactions, by seeking from any that happiness which he ought to look for in e society of one alone. He lives a gloomy tyrant midst wretches of his own making; he feels one of those endearments which spring from fection, none of those delicacies which arise om knowledge. His mistresses, being shut out om the world, and totally ignorant of all that asses there, have no arts to entertain his mind, calm his anxieties; the day passes with them sullen silence, or languid repose: appetite can rnish but few opportunities of varying the ene; and all that falls beyond it must be irkme expectation.

From this avarice of women, if I may be allowed express it so, has proceeded that jealousy and spicion which ever attends the miser: hence ose low and barbarous methods of keeping the omen of those countries guarded, and of making d procuring eunuchs to attend them. These happy creatures are of two kinds, the white d the black. The white are generally made in e country where they reside, being but partly prived of the marks of virility; the black are nerally brought from the interior parts of frica, and are made entirely bare. These are iefly chosen for their deformity; the thicker the s, the flatter the nose, and the more black the th, the more valuable the eunuch; so that the vile jealousy of mankind here inverts the order of nature, and the poor wretch finds himself valued in proportion to his deficiencies. In Italy, where this barbarous custom is still retained, and eunuchs are made in order to improve the voice, the laws are severely aimed against such practice; so that being entirely prohibited, none but the poorest and most abandoned of the people still secretly practise it upon their children. Of those served in this manner, not one in ten is found to become a singer; but such is the luxurious folly of the times, that the success of one amply compensates for the failure of the rest. It is very difficult to account for the alterations which castration makes in the voice, and the other parts of the body. The eunuch is shaped differently from others. His legs are of an equal thickness above and below; his knees weak; his shoulders narrow, and his beard thin and downy. In this manner his person is rendered more deformed; but his desires, as I am told, still continue the same; and actually, in Asia, some of them are found to have their seraglios, as well as their masters. Even in our country, we have an instance of a very fine woman being married to one of them whose appearance was the most unpromising; and what is more extraordinary still, I am told, that this couple continue perfectly happy in each other's society.

The mere necessities of life seem the only aim of the savage; the sensual pleasures are the only study of the semi-barbarian; but the refinement of sensuality by reason, is the boast of real politeness. Among the merely barbarous nations, such as the natives of Madagascar, or the inhabitants of Congo, nothing is desired so ardently as to prostitute their wives or daughters to strangers, for the most trifling advantages; they will account it a dishonour not to be among the foremost who are thus received into favour: on the other hand, the Mahometan keeps his wife faithful, by confining her person; and would instantly put her to death, if he but suspected her chastity. With the politer inhabitants of Europe both these barbarous extremes are avoided; the woman's person is left free, and no constraint is imposed but upon her affections. The passion of love, which may be considered as the nice conduct of ruder desire, is only known and practised in this part of the world; so that what other nations guard as their right, the more delicate European is contented to ask as a favour. In this manner the concurrence of mutual appetite contributes to increase mutual satisfaction; and the power on the one side of refusing makes every blessing more grateful when obtained by the other. In barbarous countries woman is considered merely as a useful slave; in such as are somewhat more refined she is regarded as a desirable toy; in countries entirely polished she enjoys juster privileges, the wife being considered as a useful friend and an agreeable mistress. Her mind is still more prized than her person; and without the improvement of both, she can never expect to become truly agreeable; for her good sense alone can preserve what she has gained by her beauty.

Female beauty, as was said, is always seen to improve about the age of puberty: but if we should attempt to define in what this beauty consists, or what constitutes its perfection, we should find nothing more difficult to determine. Every country has its peculiar way of thinking, in this respect; and even the same country thinks differently at different times. The ancients had a very different taste from what prevails at present. The eyebrows joining in the middle was considered as a very peculiar grace by Tibullus, in the enumeration of the charms of his mistress. Narrow foreheads were approved of, and scarce any of the Roman ladies, that are celebrated for their other perfections, but are also praised for the redness of their hair. The nose also of the Grecian Venus was such as would appear at present an actual deformity; as it fell in a straight line from the forehead without the smallest sinking between the eyes, without which we never see a face at present.

Among the moderns, every country seems to have peculiar ideas of beauty.[4] The Persians admire large eyebrows, joining in the middle; the edges and corners of the eyes are tinctured with black, and the size of the head is increased by a great variety of bandages, formed into a turban. In some parts of India black teeth and white hair are desired with ardour; and one of the principal employments of the women of Thibet, is to redden the teeth with herbs, and to make their hair white by a certain preparation. The passion for coloured teeth obtains also in China and Japan; where, to complete their idea of beauty, the object of desire must have little eyes, nearly closed, feet extremely small, and a waist far from being shapely. There are nations of the American Indians that flatten the head of their children, by keeping them while young squeezed between two boards, so as to make the visage much larger than it would naturally be. Others flatten the head at top; and others make it as round as they possibly can. The inhabitants along the western coasts of Africa have a very extraordinary taste for beauty. A flat nose, thick lips, and a jet black complexion, are there the most indulgent gifts of Nature. Such, indeed, they are all, in some degree, found to possess. However, they take care by art to increase their natural deformities, as they should seem to us; and they have many additional methods of rendering their persons still more frightfully pleasing. The whole body and visage is often scarred with a variety of monstrous figures; which is not done without a great pain, and repeated incision: and even sometimes parts of the body are cut away. But it would be endless to remark the various arts which caprice or custom has employed to distort and disfigure the body in order to render it more pleasing; in fact, every nation, how barbarous soever, seems unsatisfied with the human figure as Nature has left it, and has its peculiar arts of heightening beauty. Painting, powdering, cutting, boring the nose and the ears, lengthening the one and depressing the other, are arts practised in many countries; and, in some degree, admired in all. These arts might have been at first introduced to hide epidemic deformities; custom, by degrees, reconciles them to the view; till, from looking upon them with indifference, the eye at length begins to gaze with pleasure.

CHAP. V.

OF THE AGE OF MANHOOD.[1]

THE human body attains to its full height during the age of puberty; or, at least, a short time after. Some young people are found to cease growing at fourteen or fifteen; others continue their growth till two or three and twenty. During this period they are all of a slender make; their thighs and legs small, and the muscular parts are yet unfilled. But by degrees the fleshy fibres augment; the muscles swell, and assume their figure; the limbs become proportioned, and rounder; and before the age of thirty, the body in men has acquired the most perfect symmetry. In women, the body arrives at perfection much sooner, as they arrive at the age of maturity more early; the muscles, and all the other parts, being weaker, less compact and solid than those of man, they require less time in coming to perfection: and as they are less in size, that size is sooner completed. Hence the persons of women are found to be as complete at twenty, as those of men are found to be at thirty.

The body of a well-shaped man ought to be square; the muscles should be expressed with boldness, and the lines of the face strongly marked. In the woman, all the muscles should be rounder, the lines softer, and the features more delicate. Strength and majesty belong to the man; grace and softness are the peculiar embellishments of the other sex. In both every part of their form declares their sovereignty over other creatures. Man supports his body erect; his attitude is that of command; and his face, which is turned towards the heavens, displays the dignity of his station. The image of his soul is painted in his visage; and the excellence of his nature penetrates through the material form in which it is enclosed. His majestic port, his send resolute step, announce the nobleness of nk. He touches the earth only with his nity; and beholds it as if at a disdainful ce. His arms are not given him, as to creatures, for pillars of support; nor does e, by rendering them callous against the l, that delicacy of touch which furnishes ith so many of his enjoyments. His hands de for very different purposes; to second intention of his will, and to perfect the f Nature.

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[4] Buffon.

[1] This chapter is translated from Mr. Buffon, whose description is very excellent. Whatever I have added is marked by inverted commas, "thus." And in whatever trifling points I have differed, the notes will serve to show.

n the soul is at rest, all the features of the seem settled in a state of profound tran- y. Their proportion, their union, and armony, seem to mark the sweet serenity mind, and give a true information of what within. But when the soul is excited, man visage becomes a living picture; the passions are expressed with as much y as energy, where every motion is design- some correspondent feature, where every sion anticipates the will, and betrays those agitations that he would often wish to l.

particularly in the eyes that the passions nted; and in which we may most readily r their beginning. The eye seems to belong soul more than any other organ; it seems ticipate of all its emotions; as well the oft and tender as the most tumultuous ceful. It not only receives, but transmits by sympathy; the observing eye of one s the secret fire from another; and the thus often becomes general.

persons as are short-sighted, labour a particular disadvantage in this respect. re, in a manner, entirely cut off from the ge of the eyes; and this gives an air of ty to the face, which often produces very urable prepossessions. However intelli- e find such persons to be, we can scarcely ught back from our first prejudice, and continue in the first erroneous opinion. s manner we are too much induced to f men by their physiognomy; and having s, at first, caught up our judgments pre- ly, they mechanically influence us all our ter. This extends even to the very colour cut of people's clothes; and we should for son be careful, even in such trifling par- s, since they go to make up a part of the dgment which those we converse with rn to our advantage.

vivacity, or the languid motion of the ive the strongest marks to physiognomy; ir colour contributes still more to enforce ression. The different colours of the eye dark hazel, the light hazel, the green, e and gray, the whitish gray, "and also ." These different colours arise from the t colours of the little muscles that serve ract the pupil; "and they are very often found to change colour with disorder, and with age."

The most ordinary colours are the hazel and the blue, and very often both these colours are found in the eyes of the same person. Those eyes which are called black, are only of the dark hazel, which may be easily seen upon closer inspection; however, those eyes are reckoned the most beautiful where the shade is the deepest; and either in these, or the blue eyes, the fire which gives its finest impression to the eye is more distinguishable in proportion to the darkness of the tint. For this reason, the black eyes, as they are called, have the greatest vivacity; but probably the blue have the most powerful effect in beauty, as they reflect a greater variety of lights, being composed of more various colours.

This variety, which is found in the colour of the eyes, is peculiar to man, and one or two other kinds of animals; but, in general, the colour in any one individual is the same in all the rest. The eyes of oxen are brown; those of sheep of a water colour; those of goats are gray: "and it may also be, in general, remarked, that the eyes of most white animals are red; thus the rabbit, the ferret, and, even in the human race, the white Moor, all have their eyes of a red colour."

Although the eye, when put into motion, seems to be drawn on one side, yet it only moves round the centre; by which its coloured part moves nearer or farther from the angle of the eye-lids, or is elevated or depressed. The distance between the eye is less in man than in any other animal; and in some of them it is so great, that it is impossible that they should ever view the same object with both eyes at once, unless it be very far off. "This, however, in them is rather an advantage than an inconvenience, as they are thus able to watch round them, and guard against the dangers of their precarious situation."

Next to the eyes, the features, which most give a character to the face, are the eye-brows; which being, in some measure, more apparent than the other features, are most readily distinguished at a distance. "Le Brun, in giving a painter directions, with regard to the passions, places the principal expression of the face in the eye-brows." From their elevation or depression, most of the furious passions are characterized; and such as have this feature extremely moveable, are usually known to have an expressive face. By means of these we can imitate all the other passions, as they are raised or depressed at command; the rest of the features are generally fixed; or, when put into motion, they do not obey the will: the mouth and eyes, in an actor, for instance, may, by being violently distorted, give a very different expression from what he would intend: but the eye-brows can scarcely be exerted improperly; their being raised denotes all those passions which pride or pleasure inspire; and their depression marks those which are the effects of contemplation and pain; and such who have this feature, therefore, most at command, are often found to excel as actors."

The eye-lashes have an effect, in giving expression to the eye, particularly when long and close: they soften its glances, and improve its sweetness. Man and apes are the only animals that have eye-lashes both upon the upper and lower lids; all other animals want them on the lid below.

The eyelids serve to guard the ball of the eye, and to furnish it with a proper moisture. The upper lid rises and falls; the lower has scarcely any motion; and although their being moved depends on the will, yet it often happens that the will is unable to keep them open, when sleep or fatigue oppresses the mind. In birds and amphibious quadrupeds, the lower lid alone has motion; fishes and insects have no eyelids whatsoever.

The forehead makes a large part of the face, and a part which chiefly contributes to its beauty. It ought to be justly proportioned; neither too round nor too flat; neither too narrow nor too low; and the hair should come thick upon its extremities. It is known to everybody how much the hair tends to improve the face; and how much the being bald serves to take away from beauty. The highest part of the head is that which becomes bald the soonest, as well as that part which lies immediately above the temples. The hair under the temples, and at the back of the head, is very seldom known to fail, "and women are much less apt to become bald than men: Mr. Buffon seems to think that they never become bald at all; but we have too many instances of the contrary among us, not to contradict very easily the assertion. Of all parts or appendages of the body, the hair is that which is found most different, in different climates; and often not only contributes to mark the country, but also the disposition of the man. It is in general thickest where the constitution is strongest; and more glossy and beautiful where the health is most permanent. The ancients held the hair to be a sort of excrement, produced like the nails; the part next the root pushing out that immediately contiguous. But the moderns have found that every hair may be truly said to live, to receive nutriment, to fill and distend itself, like the other parts of the body. The roots, they observe, do not turn gray sooner than the extremities, but the whole hair changes colour at once; and we have many instances of persons who have grown gray in one night's time.[2] Each hair, if viewed with a microscope, is found to consist of five or six lesser ones, all wrapped up in one common covering; it appears knotted, like some sorts of grass, and sends forth branches at the joints. It is bulbous at the root, by which it imbibes its moisture from the body: and it is split at the points; so that a single hair, at its end, resembles a brush. Whatever be the size or the shape of the pore, through which the hair issues, it accommodates itself to the same; being either thick, as they are large; small, as they are less; round, triangular, and variously formed, as the pores happen to be various. The hair takes its colour from the juices flowing through it, and it is found that this colour differs in different tribes and races of people. The Americans, and the Asiatics, have their hair black, thick, straight, and shining. The inhabitants of the torrid climates of Africa have it black, short, and woolly. The people of Scandinavia have it red, long, and curled; and those of our own and the neighbouring countries, are found with hair of various colours. However, it is supposed by many, that every man resembles in his disposition the inhabitants of those countries whom he resembles in the colour and the nature of his hair; so that the black are said, like the Asiatics, to be grave and acute; the red, like the Gothic nations, to be choleric and bold. However this may be, the length and the strength of the hair is a general mark of a good constitution; and as that hair which is strongest is most commonly curled, so curled hair is generally regarded among us as a beauty. The Greeks, however, had a very different idea of beauty in this respect; and seem to have taken one of their peculiar national distinctions from the length and the straightness of the hair."

The nose is the most prominent feature in the face; but, as it has scarcely any motion, and that only in the strongest passions, it rather adds to the beauty than to the expression of the countenance. "However, I am told, by the skilful in this branch of knowledge, that wide nostrils add a great deal to the bold and resolute air of the countenance; and where they are narrow, though it may constitute beauty, it seldom improves expression." The form of the nose, and its advanced position, are peculiar to the human visage alone. Other animals, for the most part, have nostrils, with a partition between them; but none of them have an elevated nose. Apes themselves have scarcely any thing else of this feature but the nostrils; the rest of the feature lying flat upon the visage, and scarcely higher than the cheek-bones. "Among all the tribes of savage men, also, the nose is very flat; and I have seen a Tartar who had scarcely any thing else but two holes through which to breathe."

The mouth and lips, next to the eyes, are found to have the greatest expression. The passions have great power over this part of the face; and the mouth marks its different degrees by its different forms. The organ of speech still more animates this part, and gives it more life than any other feature in the countenance. The ruby colour of the lips, and the white enamel of the teeth, give it such a superiority over every other feature, that it seems to make the principal object of our regards. In fact, the whole attention is fixed upon the lips of the speaker: however rapid his discourse, however various the subject, the mouth takes correspondent situations; and deaf men have been often found to see the force of those reasonings which they could not hear, understanding every word as it was spoken.

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[2] Mr. Buffon says, that the hair begins to grow gray at the points; but the fact is otherwise.

"The under jaw in man possesses a great variety of motions; while the upper has been thought by many to be quite immoveable.[3] However, that it moves in man, a very easy experiment will suffice to convince us. If we keep the head fixed, with any thing between our teeth, the edge of a table, for instance, and then open our mouths, we shall find that both jaws recede from it at the same time; the upper jaw rises, the lower falls, and the table remains untouched between them. The upper jaw has motion as well as the under; and, what is remarkable, it has its proper muscles behind the head for thus raising and depressing it. Whenever, therefore, we eat, both jaws move at the same time, though very unequally; for the whole head moving with the upper jaw, of which it makes a part, its motions are thus less observable." In the human embryo, the under jaw is very much advanced before the upper. "In the adult, it hangs a good deal more backward; and those whose upper and under row of teeth are equally prominent, and strike directly against each other, are what the painters call underhung; and they consider this as a great defect in beauty.[4] The under jaw in a Chinese face falls greatly more backward than with us; and I am told the difference is half-an-inch, when the mouth is shut naturally." In instances of the most violent passion, the under jaw has often an involuntary quivering motion; and often also, a state of languor produces another, which is that of yawning. "Every one knows how very sympathetic this kind of languid motion is; and that for one person to yawn, is sufficient to set all the rest of the company a-yawning. A ridiculous instance of this was commonly practised upon the famous M'Laurin, one of the professors at Edinburgh. He was very subject to have his jaw dislocated; so that when he opened his mouth wider than ordinary, or when he yawned, he could not shut it again. In the midst of his harangues, therefore, if any of his pupils began to be tired of his lecture, he had only to gape or yawn, and the professor instantly caught the sympathetic affection; so that he thus continued to stand speechless, with his mouth wide open, till his servant, from the next room, was called in to set his jaw again."[5]

When the mind reflects with regret upon some good unattained or lost, it feels an internal emotion, which acting upon the diaphragm, and that upon the lungs, produces a sigh; this, when the mind is strongly affected, is repeated; sorrow succeeds these first emotions, and tears are often seen to follow: sobbing is the sigh still more invigorated; and lamentation, or crying, proceeds from the continuance of the plaintive tone of the voice, which seems to implore pity. "There is yet a silent agony, in which the mind appears to disdain all external help, and broods over its distresses with gloomy reserve. This is the most dangerous state of mind: accidents or friendship may lessen the louder kinds of grief; but all remedies for this must be had from within; and there despair too often finds the most deadly enemy."

Laughter is a sound of the voice, interrupted and pursued for some continuance. The muscles of the belly, and the diaphragm, are employed in the slightest exertions; but those of the ribs are strongly agitated in the louder; and the head sometimes is thrown backward, in order to raise them with greater ease. The smile is often an indication of kindness and good-will: it is also often found used as a mark of contempt and ridicule.

Blushing proceeds from different passions; being produced by shame, anger, pride, and joy. Paleness is often also the effect of anger; and almost ever attendant on fright and fear. These alterations in the colour of the countenance are entirely involuntary: all the other expressions of the passions are, in some small degree, under control; but blushing and paleness betray our secret purposes; and we might as well attempt to stop them, as the circulation of the blood, by which they are caused.

The whole head, as well as the features of the face, takes peculiar attitudes from its passions: it bends forward, to express humility, shame, or sorrow; it is turned to one side, in languor or in pity; it is thrown with the chin forward, in arrogance and pride; erect in self-conceit and obstinacy: it is thrown backward in astonishment; and combines its motions to the one side and the other, to express contempt, ridicule, anger, and resentment. "Painters, whose study leads to the contemplation of external forms, are much more adequate judges of these than any naturalist can be; and it is with these a general remark, that no one passion is regularly expressed on different countenances in the same manner; but that grief often sits upon the face like joy, and pride assumes the air of passion. It would be vain, therefore, in words, to express their general effect, since they are often as various as the countenances they sit upon; and in making this distinction nicely, lies all the skill of the physiognomist. In being able to distinguish what part of the face is marked by nature, and what by the mind; what part has been originally formed, and what is made by habit; constitutes this science, upon which the ancients so much valued themselves, and which we at present so little regard. Some, however, of the most acute men among us have paid great attention to this art; and by long practice, have been able to give some character of every person whose face they examined. Montaigne is well known to have disliked those men who shut one eye in looking upon any object; and Fielding asserts that he never knew a person with a steady glavering smile, but he found him a rogue. However, most of these observations, tending to a discovery of the mind by the face, are merely capricious; and Nature has kindly hid our hearts from each other, to keep us in good humour with our fellow-creatures."

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[3] Mr. Buffon is of this opinion. He says that the upper jaw is immoveable in all animals. However, the parrot is an obvious exception; and so is man himself, as shown above.

[4] Mr. Buffon says, that both jaws, in a perfect face, should be on a level: but this is denied by the best painters.

[5] Since the publication of this work, the editor has been credibly informed that the professor had not the defect here mentioned.

The parts of the head which give the least expression to the face, are the ears: and they are generally found hidden under the hair. These, which are immovable, and make so small appearance in man, are very distinguishing features in quadrupeds. They serve in them as the principal marks of the passions; the ears discover their joys or their terrors, with tolerable precision; and denote all their internal agitations. The smallest ears in men are said to be the most beautiful; but the largest are found to be the best for hearing. There are some savage nations who bore their ears, and so draw that part down that the tips of the ears are seen to rest upon their shoulders.

The strange variety in the different customs of men appears still more extravagant in their manner of wearing their beards. Some, and among others the Turks, cut the hair off their heads, and let their beards grow. The Europeans, on the contrary, shave their beards and wear their hair. The negroes shave their heads in figures at one time, in stars at another, in the manner of friars; and still more commonly in alternate stripes; and their little boys are shaved in the same manner. The Talapoins, of Siam, shave the heads and the eye-brows of such children as are committed to their care. Every nation seems to have entertained different prejudices, at different times, in favour of one part or another of the beard. Some have admired the hair upon the cheeks on each side, as we see with some low-bred men among ourselves, who want to be fine. Some like the hair lower down; some choose it curled; and others like it straight. "Some have it cut into a peak; and others shave all but the whisker. This particular part of the beard was highly prized among the Spaniards; till of late, a man without whiskers was considered as unfit for company; and where Nature had denied them, Art took care to supply the deficiency. We are told of a Spanish general, who, when he borrowed a large sum of money from the Venetians, pawned his whisker, which he afterwards took proper care to release. Kingson assures us, that a considerable part of the religion of the Tartars consists in the management of their whiskers; and that they waged a long and bloody war with the Persians, declaring them infidels, merely because they would not give their whiskers the orthodox cut.—The kings of Persia carried the care of their beards to a ridiculous excess, when they chose to wear them matted with gold thread: and even the kings of France, of the first races, had them knotted and buttoned with gold. But of all nations, the Americans take the greatest pains in cutting their hair, and plucking their beards. The under part of the beard, and all but the whisker, they take care to pluck up by the roots, so that many have supposed them to have no hair naturally growing on that part; and even Linnæus has fallen into that mistake. Their hair is also cut into bands; and no small care employed in adjusting the whisker. In fact, we have a very wrong idea of savage finery; and are apt to suppose that like the beasts of the forest, they rise and are dressed with a shake, but the reverse is true; for no birth-night beauty takes more time or pains in the adorning her person than they. I remember, when the Cherokee kings were over here, that I have waited for three hours during the time they were dressing. They never would venture to make their appearance till they had gone through the tedious ceremonies of the toilet: they had their boxes of oil and ochre, their fat and their perfumes, like the most effeminate beau, and generally took up four hours in dressing before they considered themselves as fit to be seen. We must not, therefore, consider a delicacy in point of dress, as a mark of refinement, since savages are much more difficult in this particular than the most fashionable or tawdry European. The more barbarous the people, the fonder of finery. In Europe, the lustre of jewels, and the splendour of the most brilliant colours, are generally given up to women, or to the weakest part of the other sex, who are willing to be contemptibly fine: but in Asia, these trifling fineries are eagerly sought after, by every condition of men, and as the proverb has it, we find the richest jewels in an Ethiop's ear. The passion for glittering ornaments is still stronger among the absolute barbarians, who often exchange their whole stock of provisions, and whatever else they happen to be possessed of, with our seamen, for a glass-bead, or a looking-glass."

Although fashions have arisen in different countries from fancy and caprice, these, when they become general, deserve examination. Mankind have always considered it as a matter of moment, and they will ever continue desirous of drawing the attention of each other, by such ornaments as mark the riches, the power, or the courage of the wearer. The value of those shining stones, which have at all times been considered as precious ornaments, is entirely founded upon their scarceness or their brilliancy. It is the same likewise with respect to those shining metals, the weight of which is so little regarded, when spread over our clothes. These ornaments are rather designed to draw the attention of others, than to add to any enjoyments of our own; and few there are, that these ornaments will not serve to dazzle, and who can coolly distinguish between the metal and the man.

All things rare and brilliant will, therefore, ever continue to be fashionable, while men derive greater advantage from opulence than virtue; while the means of appearing considerable, are more easily acquired, than the title to be considered. The first impression we generally make, arises from our dress; and this varies, in conformity to our inclinations, and the manner in which we desire to be considered. The modest man, or he who would wish to be thought so, desires to show the simplicity of his mind by the plainness of his dress; the vain man, on the contrary, takes a pleasure in displaying his superiority, "and is willing to incur the spectator's dislike, so he does but excite his attention."

Another point of view which men have in dressing, is to increase the size of their figure; and to take up more room in the world than Nature seems to have allotted them. We desire to swell out our clothes by the stiffness of art, and raise our heels, while we add to the largeness of our heads. How bulky soever our dress may be, our vanities are still more bulky. The largeness of the doctor's wig arises from the same pride with the smallness of the beau's queue. Both want to have the size of their understanding measured by the size of their heads.

There are some modes that seem to have a more reasonable origin, which is to hide or to lessen the defects of nature. To take men all together, there are many more deformed and plain than beautiful and shapely. The former, as being the most numerous, give law to fashion; and their laws are generally such as are made in their own favour. The women begin to colour their cheeks with red, when the natural roses are faded: and the younger are obliged to submit, though not compelled by the same necessity. In all parts of the world, this custom prevails more or less; and powdering and frizzing the hair, though not so general, seems to have risen from a similar control.

But leaving the draperies of the human picture, let us return to the figure, unadorned by art. Man's head, whether considered externally or internally, is differently formed from that of all other animals, the monkey-kind only excepted, in which there is a striking similitude.—There are some differences, however, which we shall take notice of in another place. The bodies of all quadruped animals are covered with hair; but the head of man seems the part most adorned, and that more abundantly than in any other animal.

There is a very great variety in the teeth of all animals: some have them above and below; others have them in the under jaw only; in some they stand separate from each other; while in some they are continued and united. The palate of some fishes is nothing else but a bony plate studded with points, which perform the offices of teeth. All these substances, in every animal, derive their origin from the nerves; the substance of the nerves hardens by being exposed to the air; and the nerves that terminate in the mouth, being thus exposed, acquire a bony solidity. In this manner the teeth and nails are formed in man; and in this manner also, the beak, the hoofs, the horns, and the talons, of other animals, are found to be produced.

The neck supports the head, and unites it to the body. This part is much more considerable in the generality of quadrupeds, than in man. But fishes, and other animals that want lungs similar to ours, have no neck whatsoever. Birds, in general, have the neck longer than any other kind of animals; those of them which have short claws, have also short necks; those, on the contrary, that have them long, are found to have the neck in proportion.—"In men, there is a lump upon the wind-pipe, formed by the thyroid cartilage, which is not to be seen in women; an Arabian fable says, that this is a part of the original apple, that has stuck in the man's throat by the way, but that the woman swallowed her part of it down."

The human breast is outwardly formed in a very different manner from that of other animals. It is larger in proportion to the size of the body; and none but man, and such animals as make use of their fore-feet as hands, such as monkeys, bats, and squirrels, and such quadrupeds as climb trees, are found to have those bones called the *clavicles*, or, as we usually term them, the *collar bones*.[1] The breasts in women are larger than in men; however, they seem formed in the same manner; and, sometimes, milk is found in the breasts of men, as well as in those of women. Among animals, there is a great variety in this part of the body. The teats of some, as in the ape and the elephant, are like those of men, being but two, and placed on each side of the breast. The teats of the bear amount to four. The sheep has but two, placed between the hinder legs. Other animals, such as the bitch and the sow, have them all along the belly; and as they produce many young, they have a great many teats for their support. The form also of the teats varies in different animals; and in the same animal at different ages. The bosom, in females, seems to unite all our ideas of beauty, where the out-

[6] Mr. Buffon says, that none but monkeys have them, but this is an oversight.

line is continually changing, and the gradations are soft and regular.[7]

The graceful fall of the shoulders, both in man and woman, constitute no small part of beauty. In apes, though otherwise made like us, the shoulders are high, and drawn up on each side towards the ears. In man they fall by a gentle declivity; and the more so, in proportion to the beauty of his form. In fact, being high-shouldered, is not without reason considered a deformity, for we find very sickly persons are always so, and people when dying are ever seen with their shoulders drawn up in a surprising manner. The muscles that serve to raise the ribs, mostly rise near the shoulders; and the higher we raise the shoulders, we the more easily raise the ribs likewise. It happens, therefore, in the sickly and the dying, who do not breathe without labour, that to raise the ribs, they are obliged to call in the assistance of the shoulders; and thus their bodies assume, from habit, that form which they are so frequently obliged to assume. Women with child, also, are usually seen to be high-shouldered; for the weight of the inferior parts drawing down the ribs, they are obliged to use every effort to elevate them, and thus they raise their shoulders of course. During pregnancy, also, the shape, not only of the shoulders, but also of the breast, and even the features of the face, are greatly altered; for the whole upper fore-part of the body is covered with a broad thin skin, called the myoides; which being, at that time, drawn down, it also draws down with it the skin, and, consequently, the features of the face. By these means the visage takes a particular form; the lower eyelids and the corners of the mouth, are drawn downwards; so that the eyes are enlarged, and the mouth lengthened: and women in these circumstances, are said by the midwives to be "*all mouth and ears.*"

The arms of men but very little resemble the fore-feet of quadrupeds, and much less the wings of birds. The ape is the only animal that is possessed of hands and arms; but these are much more rudely fashioned, and with less exact proportion, than in men; "the thumb not being so well opposed to the rest of the fingers, in their hands as in ours."

The form of the back is not much different in man from that of other quadruped animals, only that the reins are more muscular in him, and stronger. The buttock, however, in man, is different from that of all other animals whatsoever. What goes by that name in other creatures, is only the upper part of the thigh; man being the only animal that supports himself perfectly erect, the largeness of this part is owing to the peculiarity of his position.

Man's feet, also, are different from those of all other animals, those even of apes not excepted. The foot of the ape is rather a kind of awkward hand; its toes, or rather fingers, are long, and that of the middle longest of all. This foot also wants the heel, as in man; the sole is narrower, and less adapted to maintain the equilibrium of the body, in walking, dancing, or running.

The nails are less in man than in any other animal. If they were much longer than the extremities of the fingers, they would rather be prejudicial than serviceable, and obstruct the management of the hand. Such savages as let them grow long make use of them in flaying animals, in tearing their flesh, and such like purposes; however, though their nails are considerably larger than ours, they are by no means to be compared to the hoofs or the claws of other animals. "They may sometimes be seen longer, indeed, than the claws of any animal whatsoever; as we learn that the nails of some of the learned men in China are longer than their fingers. But these want that solidity which might give force to their exertions, and could never, in a state of nature, have served them for annoyance or defence."

There is little known exactly with regard to

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[7] Darwin supports the curious theory, that our idea of the waving line of beauty originates from our early familiarity with the female bosom. "When the babe," says he, "soon after it is born into this cold world, is applied to its mother's bosom, its sense of perceiving warmth is first agreeably affected; next its sense of smell is delighted with the odour of her milk; then its taste is gratified by the flavour of it; afterwards the appetites of hunger and of thirst afford pleasure by the possession of their objects, and by the subsequent digestion of the aliment; and lastly, the sense of touch is delighted by the softness and smoothness of the milky fountain, the source of such variety of happiness. All those various kinds of pleasure at length become associated with the form of the mother's breast; which the infant embraces with its hands, presses with its lips, and watches with its eyes; and thus acquires more accurate ideas of the form of its mother's bosom, than of the odour and flavour, or warmth, which it perceives by other senses. And hence at our maturer years, when any object of vision is represented to us, which by its waving or spiral lines bears any similitude to the form of the female bosom, whether it be found in a landscape, with soft gradations of rising and descending surface, or in the form of some antique vases, or in other works of the pencil or the chisel, we feel a general glow of delight, which seems to influence all our senses; and if the object be not too large, we experience an attraction to embrace it with our arms, and salute it with our lips, as we did in our early infancy the bosom of our mothers. And thus we find, according to the ingenious idea of Hogarth, that the waving lines of beauty were originally taken from the Temple of Venus.

'If the wide eye the wavy lawns explores,
The bending woodlands, or the winding shores,
Hills, whose green sides with soft protuberance rise,
Or the blue concave of the vaulted skies;—
Or scans with nicer gaze the pearly swell
Of spiral volutes round the twisted shell:
Or undulating sweep, whose graceful turns
Bound the smooth surface of Etrurian urns,
When on fine forms the waving lines impress'd
Give the nice curves, which swell the female breast;
The countless joys the tender mother pours,
Round the soft cradle of our infant hours,
In lively trains of unextinct delight
Rise in our bosoms, *recognised by sight;*
Fond Fancy's eye recals the form divine,
And TASTE sits smiling upon Beauty's shrine.' "*

* Temple of Nature, page 101.

portion of the human figure ; and the
of the best statues is better conceived by
g than by measuring them. The statues
nity, which were at first copied after the
form, are now become the models of it ;
there one man found whose person ap-
to those inimitable performances that
s, in one figure, united the perfections of
It is sufficient to say, that from being at
lels, they are now become originals ; and
to correct the deviations in that form
ence they were taken. I will not how-
tend to give the proportions of the
body as taken from these, there being
more arbitrary, and which good painters
es so much contemn. Some, for instance,
e studied after these, divide the body
times the length of the face ; and others
t. Some pretend to tell us, that there
itude of proportion in different parts of
. Thus, that the hand is the length of
; the thumb the length of the nose ; the
tween the eyes is the breadth of an
t the breadth of the thigh, at the thick-
uble that of the thickest part of the leg,
le the smallest ; that the arms extended
g as the figure is high ; that the legs and
e half the length of the figure. All this,
is extremely arbitrary : and the excel-
shape, or the beauty of a statue, results
attitude and position of the whole,
an any established measurements, begun
experience, and adopted by caprice. In
it may be remarked, that the propor-
r in every age, and are obviously different
wo sexes. In women, the shoulders are
, and the neck proportionably longer,
men. The hips also are considerably
d the thighs much shorter, than in men.
oportions, however, vary greatly at dif-
es. In infancy, the upper parts of the
much larger than the lower ; the legs
s do not constitute anything like half the
the whole figure ; in proportion as the
reases in age, the inferior parts are found
en ; so that the body is not equally di-
til it has acquired its full growth.

e of men varies considerably. Men are
e tall who are from five feet eight inches
t high. The middle stature is from five
to five feet eight : and those are said to
ll stature who fall under these measures.
er, it ought to be remarked, that the
son is always taller when he rises in the
than upon going to bed at night ; and
s there is an inch difference ; and I
more. Few persons are sensible of this
le variation ; and I am told, it was first
in England by a recruiting officer. He
nd that those men whom he had enlisted
rs, and answered to the appointed stan-
ne time, fell short of it when they came
asured before the colonel at the head-quarters. This diminution in their size proceeded from the different times of the day, and the different states of the body, when they happened to be measured. If, as was said, they were measured in the morning, after the night's refreshment, they were found to be commonly half-an-inch, and very often a whole inch, taller than if measured after the fatigues of the day ; if they were measured when fresh in the country, and before a long fatiguing march to the regiment, they were found to be an inch taller than when they arrived at their journey's end. All this is now well known among those who recruit for the army ; and the reason for this difference of stature is obvious. Between all the joints of the back-bone, which is composed of several pieces, there is a glutinous liquor deposited, which serves, like oil in a machine, to give the parts an easy play upon each other. This lubricating liquor, or synovia, as the anatomists call it, is poured in during the season of repose, and is consumed by exercise and employment ; so that in a body, after hard labour, there is scarce any of it remaining ; but all the joints grow stiff, and their motion becomes hard and painful. It is from hence, therefore, that the body diminishes in stature. For this moisture being drained away from between the numerous joints of the back-bone, they lie closer upon each other ; and their whole length is thus very sensibly diminished ; but sleep, by restoring the fluid again, swells the spaces between the joints, and the whole is extended to its former dimensions.

"As the human body is thus often found to differ from itself in size, so it is found to differ in its weight also ; and the same person, without any apparent cause, is found to be heavier at one time than another. If, after having eaten a hearty dinner, or having drank hard, the person should find himself thus heavier, it would appear no way extraordinary ; but the fact is, the body is very often found heavier some hours after eating a hearty meal than immediately succeeding it. If, for instance, a person, fatigued by a day's hard labour, should eat a plentiful supper, and then get himself weighed upon going to bed ; after sleeping soundly, if he is again weighed, he will find himself considerably heavier than before ; and this difference is often found to amount to a pound, or sometimes to a pound and a half. From whence this adventitious weight is derived is not easy to conceive ; the body, during the whole night, appears rather plentifully perspiring than imbibing any fluid, rather losing than gaining moisture : however, we have no reason to doubt, but that either by the lungs, or perhaps by a peculiar set of pores, it is all this time inhaling a quantity of fluid, which thus increases the weight of the whole body, upon being weighed the next morning."[8]

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[8] From this experiment also, the learned may gather upon what a weak foundation the whole doctrine

Although the human body is externally more delicate than any of the quadruped kind, it is, notwithstanding, extremely muscular; and, perhaps, for its size, stronger than that of any other animal. If we should offer to compare the strength of the lion with that of man, we should consider that the claws of this animal give us a false idea of its power; we ascribe to its force what is only the effects of its arms. Those which man has received from Nature are not offensive; happy had art never furnished him with any more terrible than those which arm the paws of the lion.

But there is another manner[9] of comparing the strength of man with other animals; namely, by the weights which either can carry. We are assured that the porters of Constantinople carry burdens of nine hundred pounds weight. Mr. Desaguliers tells us of a man, who by distributing weights in such a manner as that every part of his body bore its share, he was thus able to raise a weight of two thousand pounds. A horse, which is about seven times our bulk, would be thus able to raise a weight of fourteen thousand pounds, if its strength were in the same proportion.[10] "But the truth is, a horse will not carry upon its back above a weight of two or three hundred pounds; while a man of confessedly inferior strength is thus able to support two thousand. Whence comes this seeming superiority? The answer is obvious. Because the load upon the man's shoulders is placed to the greatest advantage; while, upon the horse's back, it is placed at the greatest disadvantage. Let us suppose for a moment the man standing as upright as possible, under the great load above mentioned. It is obvious that all the bones of his body may be compared to a pillar supporting a building, and that his muscles have scarce any share in this dangerous duty. However, they are not entirely inactive; as man, let him stand never so upright, will have some bending in different parts of his body. The muscles, therefore, give the bones some assistance, and that with the greatest possible advantage. In this manner, a man has been found to support two thousand weight; but may be capable of supporting a still greater. The manner in which this is done, is by strapping the load round the shoulders of the person who is to bear it, by a machine, something like that by which milk-vessels or water-buckets are carried. The load being thus placed on a scaffold, on each side, contrived for that purpose, and the man standing erect in the midst, all parts of the scaffold, except that where the man stands are made to sink; and thus the man maintaining his position, the load, whatever it is, becomes suspended, and the column of his bones may be fairly said to support it. If, however, he should but ever so little give way, he must inevitably drop; and no power of his can raise the weights again. But the case is very different with regard to a load laid upon a horse. The column of the bones there lies a different way; and a weight of five hundred pounds, as I am told, would break the back of the strongest horse that could be found. The great force of a horse, and other quadrupeds, is exerted when the load is in such a position as that the column of the bones can be properly applied, which is lengthwise. When, therefore, we are to estimate the comparative strength of a horse, we are not to try what he can carry, but what he can draw; and in this case, his amazing superiority over man is easily discerned; for one horse can draw a load that ten men cannot move. And in some cases it happens that a draught horse draws the better for being somewhat loaded; for, as the peasant says, the load upon the back keeps him the better to the ground."

There is still another way of estimating human strength, by the perseverance and agility of our motions. Men who are exercised in running, outstrip horses; or, at least, hold their speed for a longer continuance. In a journey, also, a man will walk down a horse; and, after they have both continued to proceed for several days, the horse will be quite tired, and the man will be fresher than in the beginning.[11] The king's messengers of Ispahan, who are runners by profession, go thirty-six leagues in fourteen hours. Travellers assure us, that the Hottentots outstrip lions in the chase; and that the savages who hunt the elk, pursue with such speed, that they at last tire down and take it. We are told many very surprising things of the great swiftness of the savages, and of the long journeys they undertake on foot, through the most craggy mountains, where there are no paths to direct, nor houses to entertain them. They are said to perform a journey of twelve hundred leagues in less than six weeks. "But notwithstanding what travellers report of this matter, I have been assured from many of our officers and soldiers who compared their own swiftness with that of the native Americans during the last war, that although the savages held out, and as the phrase is, had better bottoms, yet, for a spurt, the Englishmen were more nimble and speedy."

Nevertheless, in general, civilized man is ignor-

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of Santorian perspiration is built: but this disquisition more properly belongs to medicine than natural history.

[9] Mr. Buffon calls it a better manner; but this is not the case.

[10] Mr. Buffon carries this subject no farther; and thus far, without explanation, it is erroneous.

[11] This may be flattering to humanity: but in justice to the poor horse it may be stated, that a fair trial has never been made of the respective powers of man and horse in regard to pedestrianism. If there were, there can be little doubt but that the horse would prove his superiority. Arab horses, for example, are known to carry their riders and accoutrements across the desert for many successive days, at the rate of 70 and 80 miles a-day How far they might go without weight, may be imagined, but has never been tried.—ED.

ıt of his own powers: he is ignorant how much
: loses by effeminacy; and what might be ac-
ıired by habit and exercise. Here and there,
deed, men are found among us of extraordinary
rength; but that strength, for want of oppor-
nity, is seldom called into exertion. "Among
e ancients it was a quality of much greater use
an at present; as in war the same man that
d strength sufficient to carry the heaviest
mour, had strength sufficient also to strike the
ost fatal blow. In this case, his strength was
once his protection and his power. We ought
t to be surprised, therefore, when we hear of
e man terrible to an army, and irresistible in
s career, as we find some generals represented
ancient history. But we may be very certain
at this prowess was exaggerated by flattery,
d exalted by terror. An age of ignorance is
er an age of wonder. At such times, mankind,
ıving no just ideas of the human powers, are
illing rather to represent what they wish, than
hat they know; and exalt human strength, to
l up the whole sphere of their limited concep-
ons. Great strength is an accidental thing;
o or three in a country may possess it; and
ese may have a claim to heroism. But what
ay lead us to doubt of the veracity of these
counts is, that the heroes of antiquity are re-
esented as the sons of heroes; their amazing
rength is delivered down from father to son;
d this we know to be contrary to the course of
ture. Strength is not hereditary, although
tles are: and I am very much induced to be-
eve, that this great tribe of heroes, who are all
presented as the descendants of heroes, are
ore obliged to their titles than to their strength,
r their characters. With regard to the shining
aracters in Homer, they are all represented as
inces, and as the sons of princes; while we
e told of scarce any share of prowess in the
eaner men of the army; who are only brought
to the field for these to protect, or to slaughter.
ut nothing can be more unlikely than that those
en, who were bred in the luxury of courts,
ould be strong; while the whole body of the
ople, who received a plainer and simpler educa-
on, should be comparatively weak. Nothing
n be more contrary to the general laws of na-
re, than that all the sons of heroes should thus
herit not only the kingdoms, but the strength
their forefathers; and we may conclude, that
ey owe the greatest share of their imputed
rength rather to the dignity of their stations
an the force of their arms; and, like all for-
nate princes, their flatterers happened to be
lieved. In later ages, indeed, we have some
counts of amazing strength, which we can have
reason to doubt of. But in these, nature is
und to pursue her ordinary course; and we find
eir strength accidental. We find these strong
en among the lowest of the people, and gradu-
y rising into notice, as this superiority had
ore opportunity of being seen. Of this number was the Roman tribune, who went by the name of the second Achilles; who, with his own hand, is said to have killed, at different times, three hundred of the enemy; and when treacherously set upon, by twenty-five of his own countrymen, although then past his sixtieth year, killed fourteen of them before he was slain. Of this number was Milo, who, when he stood upright, could not be forced out of his place. Pliny also tells us of one Athanatus, who walked across the stage at Rome, loaded with a breastplate weighing five hundred pounds, and buskins of the same weight. But of all the prodigies of strength, of whom we have any accounts in Roman history, Maximin, the emperor, is to be reckoned the foremost. Whatever we are told relative to him is well attested; his character was too exalted not to be throughly known: and that very strength, for which he was celebrated, at last procured him no less a reward than the empire of the world. Maximin was above nine feet in height, and the best proportioned man in the whole empire. He was by birth a Thracian; and, from being a simple herdsman, rose through the gradations of office, until he came to be emperor of Rome. The first opportunity he had of exerting his strength, was in the presence of all the citizens, in the theatre, where he overthrew twelve of the strongest men in wrestling, and outstript two of the fleetest horses in running, all in one day. He could draw a chariot loaden, that two strong horses could not move; he could break a horse's jaw with a blow of his fist, and its thigh with a kick. In war he was always foremost and invincible: happy had it been for him and his subjects if, from being formidable to his enemies, he had not become still more so to his subjects; he reigned, for some time, with all the world his enemy; all mankind wishing him dead, yet none daring to strike the blow. As if fortune had resolved that through life he should continue unconquerable, he was killed at last by his own soldiers while he was sleeping. We have many other instances, in later ages, of very great strength, and not fewer of amazing swiftness; but these, merely corporeal perfections, are now considered as of small advantage, either in war or in peace. The invention of gunpowder has, in some measure, levelled all force to one standard: and has wrought a total change in martial education through all parts of the world. In peace also the invention of new machines every day, and the application of the strength of the lower animals to the purposes of life, have rendered human strength less valuable. The boast of corporeal force is, therefore, consigned to savage nations, where those arts not being introduced, it may still be needful; but in more polite countries, few will be proud of that strength which other animals can be taught to exert to as useful purposes as they.

"If we compare the largeness and thickness of our muscles with those of any other animal, we shall find that, in this respect, we have the advantage; and if strength or swiftness depended upon the quantity of muscular flesh alone, I believe that, in this respect, we should be more active and powerful than any other. But this is not the case; a great deal more than the size of the muscles goes to constitute activity or force; and it is not he who has the thickest legs that can make the best use of them. Those therefore who have written elaborate treatises on muscular force, and have estimated the strength of animals by the thickness of their muscles, have been employed to very little purpose. It is in general observed, that thin and raw-boned men are always stronger and more powerful than such as are seemingly more muscular; as in the former all the parts have better room for their exertions."

Women want much of the strength of men; and in some countries the stronger sex have availed themselves of the superiority, in cruelly and tyrannically enslaving those who were made with equal pretensions to a share in all the advantages life can bestow. Savage nations oblige their women to a life of continual labour; upon them rest all the drudgeries of domestic duty, while the husband, indolently reclined in his hammock, is first served from the fruits of her industry. From this negligent situation he is seldom roused, except by the calls of appetite, when it is necessary, either by fishing or hunting, to make a variety in his entertainments. A savage has no idea of taking pleasure in exercise; he is surprised to see a European walk forward for his amusement, and then return back again. As for his part, he could be contented to remain for ever in the same situation, perfectly satisfied with sensual pleasures and undisturbed repose. The women of these countries are the greatest slaves upon earth: sensible of their weakness, and unable to resist, they are obliged to suffer those hardships which are naturally inflicted by such as have been taught that nothing but corporeal force ought to give pre-eminence. It is not, therefore, till after some degree of refinement, that women are treated with lenity; and not till the highest degree of politeness, that they are permitted to share in all the privileges of man. The first impulse of savage nature is to confirm their slavery; the next of half-barbarous nations, is to appropriate their beauty; and that of the perfectly polite, to engage their affections. In civilized countries, therefore, women have united the force of modesty to the power of their natural charms; and thus obtain that superiority over the mind, which they are unable to extort by their strength.

CHAP. VI.

OF SLEEP AND HUNGER.

As man, in all the privileges he enjoys, and the powers he is invested with, has a superiority over all other animals, so in his necessities he seems inferior to the meanest of them all. Nature has brought him into life with a greater variety of wants and infirmities than the rest of her creatures, unarmed in the midst of enemies. The lion has natural arms; the bear natural clothing; but man is destitute of all such advantages; and from the superiority of his mind alone he is to supply the deficiency. The number of his wants, however, were merely given, in order to multiply the number of his enjoyments; since the possibility of being deprived of any good, teaches him the value of its possession. Were man born with those advantages which he learns to possess by industry, he would very probably enjoy them with a blunter relish; it is by being naked that he knows the value of a covering; it is by being exposed to the weather, that he learns the comforts of a habitation. Every want thus becomes a means of pleasure, in the redressing; and the animal that has most desires, may be said to be capable of the greatest variety of happiness.

Besides the thousand imaginary wants peculiar to man, there are two, which he has in common with all other animals; and which he feels in a more necessary manner than they. These are the wants of sleep and hunger. Every animal that we are acquainted with, seems to endure the want of these with much less injury to health than man; and some are more surprisingly patient in sustaining both. The little domestic animals that we keep about us, may often set a lesson of calm resignation, in supporting want and watchfulness, to the boasted philosopher. They receive their pittance at uncertain intervals, and wait its coming with cheerful expectation. We have instances of the dog and the cat living in this manner, without food, for several days; and yet still preserving their attachment to the tyrant that oppresses them; still ready to exert their little services for his amusement or defence. But the patience of these is nothing to what the animals of the forest endure. As these mostly live upon accidental carnage, so they are often known to remain without food for several weeks together. Nature, kindly solicitous for their support, has also contracted their stomachs, to suit them for their precarious way of living; and kindly, while it abridges the banquet, lessens the necessity of providing for it.

But the meaner tribes of animals are made still more capable of sustaining life without food, many of them remaining in a state of torpid indifference, till their prey approaches, when they jump upon and seize it. In this manner, the snake, or the spider, continue, for several months together, to subsist upon a single meal; and some of the butterfly kinds live upon little or nothing. But it is very different with man: his wants daily make their importunate demands; and it is known that he cannot continue to live many days without eating, drinking, and sleeping.

Hunger is a much more powerful enemy to man than watchfulness, and kills him much sooner. It may be considered as a disorder that food removes; and that would quickly be fatal, without its proper antidote. In fact, it is so terrible to man, that to avoid it he even encounters certain death; and, rather than endure its tortures, he exchanges them for immediate destruction. However, by what I have been told, it is much more dreadful in its approaches, than in its continuance; and the pains of a famishing wretch decrease, as his strength diminishes. In the beginning the desire of food is dreadful indeed, as we know by experience, for there are few who have not, in some degree, felt its approaches. But, after the first or second day, its tortures become less terrible, and a total insensibility at length comes kindly in to the poor wretch's assistance. I have talked with the captain of a ship, who was one of six that endured it in its extremities; and who was the only person that had not lost his senses, when they received accidental relief. He assured me, his pains at first were so great, as to be often tempted to eat a part of one of the men who died; and which the rest of his crew actually for some time lived upon: he said that during the continuance of this paroxysm, he found his pains insupportable; and was desirous, at one time, of anticipating that death which he thought inevitable: but his pains, he said, gradually decreased, after the sixth day, (for they had water in the ship, which kept them alive so long,) and then he was in a state rather of languor than desire; nor did he much wish for food, except when he saw others eating; and that for a while revived his appetite, though with diminished importunity. The latter part of the time, when his health was almost destroyed, a thousand strange images rose upon his mind; and every one of his senses began to bring him wrong information. The most fragrant perfumes appeared to him to have a fœtid smell; and every thing he looked at took a greenish hue, and sometimes a yellow. When he was presented with food by the ship's company that took him and his men up, four of whom died shortly after, he could not help looking upon it with loathing instead of desire; and it was not till after four days, that his stomach was brought to its natural tone, when the violence of his appetite returned, with a sort of canine eagerness.

Thus dreadful are the effects of hunger; and yet when we come to assign the cause that produces them, we find the subject involved in doubt and intricacy. This longing eagerness is, no doubt, given for a very obvious purpose; that of replenishing the body, wasted by fatigue and perspiration. Were not men stimulated by such a pressing monitor, they might be apt to pursue other amusements, with a perseverance beyond the power; and forget the useful hours of refreshment, in those more tempting ones of pleasure. But hunger makes a demand that will not be refused; and, indeed, the generality of mankind seldom await the call.

Hunger has been supposed by some to arise from the rubbing of the coats of the stomach against each other, without having any intervening substance to prevent their painful attrition Others have imagined that its juices wanting their necessary supply, turn acrid, or, as some say, pungent; and thus fret its internal coats, so as to produce a train of the most uneasy sensations. Boerhaave, who established his reputation in physic, by uniting the conjectures of all those that preceded him, ascribes hunger to the united effect of both these causes; and asserts, that the pungency of the gastric juices, and the attrition of its coats against each other, cause those pains, which nothing but food can remove.[1] These juices continuing still to be separated in the stomach, and every moment becoming more acrid, mix with the blood, and infect the circulation: the circulation being thus contaminated, becomes weaker, and more contracted; and the whole nervous frame sympathizing, a hectic fever, and sometimes madness, is produced; in which state the faint wretch expires. In this manner, the man who dies of hunger may be said to be poisoned by the juices of his own body; and is destroyed less by the want of nourishment, than by the vitiated qualities of that which he had already taken.

However this may be, we have but few instances of men dying, except at sea, of absolute hunger. The decline of those unhappy creatures who are destitute of food, at land, being more slow and unperceived. These, from often being in need, and as often receiving accidental supply, pass their lives between surfeiting and repining; and their constitution is impaired by insensible degrees. Man is unfit for a state of precarious expectation. That share of provident precaution which incites him to lay up stores for a distant day, becomes his torment, when totally unprovided against an immediate call. The lower race of animals, when satisfied, for the instant moment, are perfectly happy: but it is otherwise with man; his mind anticipates distress, and feels the pangs of want even before it arrests him. Thus the mind, being continually harassed by the situation, it at length influences the constitution, and unfits it for all its functions. Some cruel disorder, but no way like hunger, seizes the unhappy sufferer; so that almost all those men who have thus long lived by chance, and whose every day may be considered as a happy escape from famine, are known at last to die in reality of a disorder caused by hunger; but which, in the common language, is often called a *broken heart*. Some of these I have known myself, when very little able to relieve them: and I have been told by a very active and worthy magistrate, that the number of such as die in London for want, is much greater than one would imagine—I think he talked of two thousand in a year!

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[1] The proximate cause of hunger has by some—as stated in the text—been conceived to depend on the friction of the nervous papillæ of the empty stomach on each other; by others, it has been imputed to the irritation produced on its parietes by the accumulation of the gastric juice. It has been thought to depend on the lassitude attending the permanent contraction of the muscular fibres of the stomach; and on the compression and creasing of the nerves, during that permanent constriction; on the dragging down of the diaphragm by the liver and spleen, when the stomach and intestines being empty, cease to support those viscera: a dragging which is the greater, as a new mode of circulation takes place in the viscera, which are supplied with blood by the cæliac artery, and while the stomach receives less blood, the spleen and the liver increase in weight and size, because their supply is increased.—*Richeraud*.

But how numerous soever those who die of hunger may be, many times greater, on the other hand, are the number of those who die by repletion. It is not the province of the present page to speculate, with the physician, upon the danger of surfeits; or, with the moralist, upon the nauseousness of gluttony: it will only be proper to observe, that as nothing is so prejudicial to health as hunger by constraint, so nothing is more beneficial to the constitution than voluntary abstinence. It was not without reason that religion enjoined this duty; since it answered the double purpose of restoring the health oppressed by luxury, and diminished the consumption of provisions, so that a part might come to the poor. It should be the business of the legislature, therefore, to enforce this divine precept; and thus, by restraining one part of mankind in the use of the superfluities, to consult for the benefit of those who want the necessaries of life. The injunctions for abstinence are strict over the whole Continent; and were rigorously observed even among ourselves, for a long time after the Reformation. Queen Elizabeth, by giving her commands upon this head the air of a political injunction, lessened, in a great measure, and in my opinion very unwisely, the religious force of the obligation. She enjoined that her subjects should fast from flesh on Fridays and Saturdays; but at the same time declared, that this was not commanded from motives of religion, as if there were any differences in meats, but merely to favour the consumption of fish, and thus to multiply the number of mariners; and also to spare the stock of sheep, which might be more beneficial in another way. In this manner the injunction defeated its own force; and this most salutary law became no longer binding, when it was supposed to come purely from man. How far it may be enjoined in the Scripture, I will not take upon me to say; but this may be asserted, that if the utmost benefit to the individual, and the most extensive advantage to society, serve to mark any institution as of Heaven, this of abstinence may be reckoned among the foremost.

Were we to give an history of the various benefits that have arisen from this command, and how conducive it has been to long life, the instances would fatigue with their multiplicity. It is surprising to what a great age the primitive Christians of the East, who retired from persecution in the deserts of Arabia, continued to live, in all the bloom of health, and yet all the rigours of abstemious discipline. Their common allowance, as we are told, for four and twenty hours, was twelve ounces of bread, and nothing but water. On this simple beverage, St. Anthony is said to have lived a hundred and five years: James, the hermit, a hundred and four; Arsenius, tutor to the emperor Arcadius, a hundred and twenty; St. Epiphanius, a hundred and fifteen; Simeon, a hundred and twelve; and Rombald, a hundred and twenty. In this manner did these holy temperate men live to an extreme old age, kept cheerful by strong hopes, and healthful by moderate labour.

Abstinence, which is thus voluntary, may be much more easily supported than constrained hunger. Man is said to live without food for seven days; which is the usual limit assigned him; and perhaps, in a state of constraint, this is the longest time he can survive the want of it. But in cases of voluntary abstinence, of sickness, or sleeping, he has been known to live much longer.

In the records of the Tower, there is an account of a Scotchman imprisoned for felony, who for the space of six weeks took not the least sustenance, being exactly watched during the whole time; and for this he received the king's pardon.[2]

When the American Indians undertake long journeys, and when, consequently, a stock of provisions sufficient to support them the whole way, would be more than they could carry; in order to obviate this inconvenience, instead of carrying the necessary quantity, they contrive a method of palliating their hunger, by swallowing pills, made of calcined shells and tobacco. These pills take away all appetite, by producing a temporary disorder in the stomach; and, no doubt, the frequent repetition of this wretched expedient must at last be fatal. By these means, however, they continue several days without eating, cheerfully bearing such extremes of fatigue and watching as would quickly destroy men bred up in a greater state of delicacy. For those arts by which we learn to obviate our necessities, do not fail to unfit us for their accidental encounter.

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[2] It is a pity Goldsmith was not more explicit on this extraordinary and incredible case. We do not recollect of ever having seen it adverted to elsewhere, and we are inclined to suppose it a gratuitous illustration of the old English creed regarding the hunger-enduring capabilities of the Scotch. It is not to be denied, however, that many wonderful instances of abstinence from food for months, and even years, are on record, but these were always occasioned or accompanied by fever torpor, or other diseased states of body.—ED.

Upon the whole, therefore, man is less able to support hunger than any other animal; and he is not better qualified to support a state of watchfulness. Indeed, sleep seems much more necessary to him than to any other creature: as, when awake, he may be said to exhaust a greater proportion of the nervous fluid; and, consequently, to stand in need of an adequate supply. Other animals, when most awake, are but little removed from a state of slumber; their feeble faculties, imprisoned in matter, and rather exerted by impulse than deliberation, require sleep, rather as a cessation from motion than from thinking. But it is otherwise with man; his ideas, fatigued with their various excursions, demand a cessation, not less than the body, from toil: and he is the only creature that seems to require sleep from double motives; not less for the refreshment of the mental than of the bodily frame.

There are some lower animals, indeed, that seem to spend the greatest part of their lives in sleep; but properly speaking, the sleep of such may be considered as a kind of death; and their waking, a resurrection. Flies and insects are said to be asleep, at a time that all the vital motions have ceased, without respiration, without any circulation of their juices; if cut in pieces, they do not awake, nor does any fluid ooze out at the wound. These may be considered rather as congealed than as sleeping animals; and their rest, during winter, rather as a cessation from life than a necessary refreshment; but in the higher races of animals, whose blood is not thus congealed and thawed by heat, these all bear the want of sleep much better than man; and some of them continue a long time without seeming to take any refreshment from it whatsoever.[3]

But man is more feeble; he requires its due return; and if it fails to pay the accustomed visit, his whole frame is in a short time thrown into disorder: his appetite ceases; his spirits are dejected; his pulse becomes quicker and harder; and his mind, abridged of its slumbering visions, begins to adopt waking dreams. A thousand strange phantoms arise, which come and go without his will: these, which are transient in the beginning, at last take firm possession of the mind, which yields to their dominion, and after a long struggle, runs into confirmed madness. In that horrid state, the mind may be considered as a city without walls, open to every insult, and paying homage to every invader; every idea that then starts with any force, becomes a reality; and the reason, over-fatigued with its former importunities, makes no head against the tyrannical invasion, but submits to it from mere imbecility.

But it is happy for mankind, that this state of inquietude is seldom driven to an extreme; and that there are medicines which seldom fail to give relief. However, man finds it more difficult than any other animal to procure sleep: and some are obliged to court its approaches for several hours together, before they incline to rest. It is in vain that all light is excluded; that all sounds are removed; that warmth and softness conspire to invite it; the restless and busy mind still retains its former activity; and Reason, that wishes to lay down the reins, in spite of herself is obliged to maintain them. In this disagreeable state, the mind passes from thought to thought, willing to lose the distinctness of perception, by increasing the multitude of the images. At last, when the approaches of sleep are near, every object of the imagination begins to mix with that next it; their outlines become, in a manner, rounder; a part of their distinctions fades away; and sleep, that ensues, fashions out a dream from the remainder.

If then it should be asked, from what cause this state of repose proceeds, or in what manner sleep thus binds us for several hours together? I must fairly confess my ignorance; although it is easy to tell what philosophers say upon the subject. Sleep, says one of them,[4] consists in a scarcity of spirits, by which the orifices or pores of the nerves in the brain, through which the spirits used to flow into the nerves, being no longer kept open by the frequency of the spirits, shut of themselves; thus the nerves, wanting a new supply of spirits, become lax, and unfit to convey any impression to the brain. All this, however, is explaining a very great obscurity by somewhat more obscure; leaving, therefore, those spirits to open and shut the entrances to the brain, let us be contented with simply enumerating the effects of sleep upon the human constitution.

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[3] Most animals sleep more than man; some indeed for months—as the hibernating tribes of bats, dormice, marmots, and bears. Cats and dogs would seem to have the faculty at will, as have some idiots and persons of a low order of intellect. The ideas, or impressions upon their minds, are so feeble, or so few, or are made at such long intervals, that succession is lost for want of continuity; hence the organ retains imperfectly, and but for an instant, the image which the external senses have presented to it; weariness supervenes; unconsciousness follows; and lastly, sleep, as a necessary consequence of inanition, is induced. It is observed, however, that monkeys do not sleep so much as other animals. Whence is this apparent deviation from the ordinary law of nature affecting animals? Is a monkey a reasoning animal? Observe a dog chained; he twists his chain, shortens it, and cuts himself off from his platter. Does he seek to untwist it—to restore the links to their wonted extension? No; he continues tugging and howling, till some friendly hand frees him from his toils, and restores him to his former range. But how is it with the monkey under similar difficulties? Why, he deliberately untwists the chain which he cannot sunder, and hence evinces something like reason. Is the sleeplessness of monkeys, then, a proof of reason? We think so. But infants, they are frequently sleepless? Yes; but never in a state of health. Restlessness in them is always an indication of hunger or a symptom of disease. The absence of sleep cannot be long sustained. Damiens slept on the rack; Luke in his iron crown; and a batallion of infantry have been known to slumber during a march! Muleteers frequently sleep on their mules, post-boys on their horses, and seamen "on the high and giddy mast." "Massa call you," said a Negro to his comrade who had fallen asleep near him; "Sleep has no massa," replied the wearied boy; and he was right. We may bear the privation of fire, food, and even drink, longer than we can the want of sleep.—*Binns' Anatomy of Sleep.*

[4] Rohault.

In sleep, the whole nervous frame is relaxed, while the heart and the lungs seem more forcibly exerted. This fuller circulation produces also a swelling of the muscles, as they always find who sleep with ligatures on any part of their body. This increased circulation also, may be considered as a kind of exercise, which is continued through the frame; and by this, the perspiration becomes more copious, although the appetite for food is entirely taken away. Too much sleep dulls the apprehension, weakens the memory, and unfits the body for labour. On the contrary, sleep too much abridged, emaciates the frame, produces melancholy, and consumes the constitution. It requires some care, therefore, to regulate the quantity of sleep, and just to take as much as will completely restore nature, without oppressing it. The poor, as Otway says, sleep little; forced by their situation, to lengthen out their labour to their necessities, they have but a short interval for this pleasing refreshment; and I have ever been of opinion, that bodily labour demands a less quantity of sleep than mental. Labourers and artisans are generally satisfied with about seven hours; but I have known some scholars who usually slept nine, and perceived their faculties no way impaired by oversleeping.

The famous Philip Barrettiere, who was considered as a prodigy of learning at the age of fourteen, was known to sleep regularly twelve hours in the twenty-four; the extreme activity of his mind when awake, in some measure called for an adequate alternation of repose; and, I am apt to think, that when students stint themselves in this particular, they lessen the waking powers of the imagination, and weaken its most strenuous exertions. Animals that seldom think, as was said, can very easily dispense with sleep; and of men, such as think least, will, very probably, be satisfied with the smallest share. A life of study, it is well known, unfits the body for receiving this gentle refreshment; the approaches of sleep are driven off by thinking: when, therefore, it comes at last, we should not be too ready to interrupt its continuance.

Sleep is indeed, to some, a very agreeable period of their existence: and it has been a question in the schools, Which was most happy, the man who was a beggar by night, and a king by day; or he who was a beggar by day, and a king by night? It is given in favour of the nightly monarch, by him who first started the question: "For the dream," says he, "gives the full enjoyment of the dignity, without its attendant inconveniences; while, on the other hand, the king who supposes himself degraded, feels all the misery of his fallen fortune, without trying to find the comforts of his humble situation. Thus, by day, both states have their peculiar distresses; but, by night, the exalted beggar is perfectly blessed, and the king completely miserable." All this, however, is rather fanciful than just; the pleasure dreams can give us, seldom reaches to our waking pitch of happiness: the mind often, in the midst of its highest visionary satisfactions, demands of itself, whether it does not owe them to a dream; and frequently awakes with the reply.

But it is seldom, except in cases of the highest delight, or the most extreme uneasiness, that the mind has power thus to disengage itself from the dominion of fancy. In the ordinary course of its operations, it submits to those numberless fantastic images that succeed each other, and which, like many of our waking thoughts, are generally forgotten. Of these, however, if any, by their oddity, or their continuance, affect us strongly, they are then remembered; and there have been some who felt their impressions so strongly, as to mistake them for realities, and to rank them among the past actions of their lives.

There are others upon whom dreams seem to have a very different effect, and who, without seeming to remember their impressions the next morning, have yet shown, by their actions during sleep, that they were very powerfully impelled by their dominion. We have numberless instances of such persons who, while asleep, have performed many of the ordinary duties to which they had been accustomed when waking; and, with a ridiculous industry, have completed by night, what they failed doing by day. We are told, in the German Ephemerides, of a young student, who being enjoined a severe exercise by his tutor, went to bed, despairing of accomplishing it. The next morning awaking, to his great surprise, he found the task fairly written out, and finished in his own handwriting. He was at first, as the account has it, induced to ascribe this strange production to the operations of an infernal agent; but his tutor, willing to examine the affair to the bottom, set him another exercise, still more severe than the former, and took precautions to observe his conduct the whole night. The young gentleman, upon being so severely tasked, felt the same inquietude that he had done on the former occasion; went to bed gloomy and pensive, pondering on the next day's duty, and after some time fell asleep. But shortly after, his tutor, who continued to observe him from a place that was concealed, was surprised to see him get up, and very deliberately go to the table, where he took out pen, ink, and paper, drew himself a chair, and sat very methodically to thinking: it seems, that his being asleep, only served to strengthen the powers of his imagination; for he very quickly and easily went through the task assigned him; put his chair aside, and then returned to bed to take out the rest of his nap. What credit we are to give to this account, I will not pretend to determine; but this may be said, that the book from whence it is taken, has some good marks of veracity; for it is very learned, and very dull; and is written in a country noted, if not for truth, at least for want of invention.[4]

The ridiculous story of Arlotto is well known, who has had a volume written, containing a narrative of the actions of his life, not one of which was performed while he was awake. He was an Italian Franciscan friar, extremely rigid in his manners, and remarkably devout and learned in his daily conversation. By night, however, and during his sleep, he played a very different character from what he did by day, and was often detected in very atrocious crimes. He was at one time detected in actually attempting a rape, and did not awake till the next morning, when he was surprised to find himself in the hands of justice. His brothers of the convent often watched him while he went very deliberately into the chapel, and there attempted to commit sacrilege. They sometimes permitted him to carry the chalice and the vestments away into his own chamber, and the next morning amused themselves at the poor man's consternation for what he had done. But of all his sleeping transgressions, that was the most ridiculous, in which he was called to pray for the soul of a person departed. Arlotto, after having very devoutly performed his duty, retired to a chamber, which was shown him, to rest; but he had no sooner fallen asleep, than he began to reflect that the dead body had got a ring upon one of the fingers, which might be useful to him: accordingly, with a pious resolution of stealing it, he went down, undressed as he was, into a room full of women, and, with great composure, endeavoured to seize the ring. The consequence was, that he was taken before the inquisition for witchcraft; and the poor creature had like to have been condemned, till his peculiar character accidentally came to be known: however, he was ordered to remain for the rest of life in his own convent, and upon no account whatsoever to stir abroad.

What are we to say to such actions as these? or how account for this operation of the mind in dreaming?[5] It should seem that the imagination, by day, as well as by night, is always employed; and that often against our wills, it intrudes, where it is least commanded or desired. While awake, and in health, this busy principle cannot much delude us: it may build castles in the air, and raise a thousand phantoms before us; but we have every one of the senses alive to bear testimony to its falsehood. Our eyes show us that the prospect is not present: our hearing and our touch depose against its reality; and our taste and smelling are equally vigilant in detecting the imposture. Reason, therefore, at once gives judgment upon the cause, and the vagrant intruder, Imagination, is imprisoned, or banished from the mind. But in sleep it is otherwise; having, as much as possible, put our senses from their duty, having closed the eyes from seeing, and the ears, taste, and smelling, from their peculiar functions, and having diminished even the touch itself, by all the arts of softness, the imagination is then left to riot at large, and to lead the understanding without an opposer. Every incursive idea then becomes a reality; and the mind, not having one power that can prove the illusion, takes them for truths. As in madness, the senses, from struggling with the imagination, are at length forced to submit; so, in sleep, they seem for a while soothed into the like submission: the smallest violence exerted upon any one of them, however, rouses all the rest in their mutual defence; and the imagination, that had for a while told its thousand falsehoods, is totally driven away, or only permitted to pass under the custody of such as are every moment ready to detect its imposition.

CHAP. VII.

OF SEEING.[1]

"Having mentioned the senses as correcting the errors of the imagination, and, as forcing it, in some measure to bring us just information, it will naturally follow that we should examine the nature of those senses themselves: we shall thus be enabled to see how far they also impose on us, and how far they contribute to correct each other. Let it be observed, however, that in this we are neither giving a treatise of optics nor phonics, but a history of our own perceptions: and to those we chiefly confine ourselves."

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[4] This hit at the Germans, it need scarcely be said, does not *now* apply to them, as, since Goldsmith's time, they have proved themselves, by their literary works, to be a people of the most fertile fancy.—Ed.

[5] Although sleep implies the perfect repose of the organs of sensation and of motion, some of these organs persist in their activity; which obliges us to acknowledge intermediate states between sleep and waking, real mixed situations, which belong, more or less, to one or to the other. Let us suppose, for instance, that the imagination reproduces, in the brain, sensations it has formerly known, the intellect works, associates, and combines ideas, often discordant, and sometimes natural, brings forth monsters, horrible, or fantastic, or ridiculous; raises joy, hope, grief, surprise, or terror; and all these fancies, all these emotions, are recollected more or less distinctly, when we are again awake, so as to allow no doubt but that the brain has been really in action, during the repose of the organs of sense and emotion. *Dreams* is the name given to these phenomena. Sometimes we speak in sleep, and this brings us a little nearer to the state of waking, since to the action of the brain is added that of the organs of speech. Finally, all the relative functions are capable of action, excepting the outward senses. The brain acts, and determines the action of the organs of motion or speech, only in consequence of former impressions; and this state, which differs from waking only by the inaction of the senses, is called *somnambulism*.—*Richeraud*.

[1] This chapter is taken from Mr. Buffon. I believe the reader will readily excuse any apology; and

The eyes very soon begin to be formed in the human embryo, and in the chicken also. Of all the parts which the animal has double, the eyes are produced the soonest, and appear the most prominent. It is true, indeed, that in viviparous animals, and particularly in man, they are not so large in proportion, at first, as in the oviparous kinds; nevertheless they are more speedily developed, when they begin to appear, than any other parts of the body. It is the same with the organ of hearing; the little bones that compose the internal parts of the ear are entirely formed before the other bones, though much larger, have acquired any part of their growth or solidity. Hence it appears, that those parts of the body which are furnished with the greatest quantity of nerves, are the first in forming. Thus the brain and the spinal-marrow are the first seen begun in the embryo; and, in general, it may be said, that wherever the nerves go, or send their branches in great numbers, there the parts are soonest begun, and the most completely finished.

If we examine the eyes of a child some hours, or even some days after its birth, it will be easily discerned that it as yet makes no use of them. The humour of the organ not having acquired a sufficient consistence, the rays of light strike but confusedly upon the retina, or expansion of nerves at the back of the eye. It is not till about a month after they are born that children fix them upon objects; for, before that time, they turn them indiscriminately everywhere, without appearing to be affected by any. At six or seven weeks old they plainly discover a choice in the objects of their attention; they fix their eyes upon the most brilliant colours, and seem peculiarly desirous of turning them towards the light. Hitherto, however, they only seem to fortify the organ for seeing distinctly; but they have still many illusions to correct.

The first great error in vision is, that the eye inverts every object: and it in reality appears to the child, until the touch has served to undeceive it, turned upside down. A second error in vision is, that every object is seen double. The same object forms itself distinctly upon each eye; and is consequently seen twice. This error, also, can only be corrected by the touch; and although, in reality, every object we see appears inverted and double, yet the judgment and habit have so often corrected the sense, that we no longer submit to its imposition, but see every object in its just position, the very instant it appears. Were we, therefore, deprived of feeling, our eyes would not only misrepresent the situation, but also the number, of all things around us.

To convince us that we see objects inverted, we have only to observe the manner in which images are represented, coming through a small hole in a darkened room. If such a small hole be made in a dark room, so that no light can come in but through it, all the objects without will be painted on the wall behind, but in an inverted position, their heads downwards. For as all the rays which pass from the different parts of the object without, cannot enter the hole in the same extent which they had in leaving the object; since, if so, they would require the aperture to be as large as the object; and, as each part and every point of the object sends forth the image of itself on every side, and the rays which form these images pass from all points of the object as from so many centres, so such only can pass through the small aperture as come in opposite directions. Thus the little aperture becomes a centre for the entire object; through which the rays from the upper parts as well as from the lower parts of it, pass in converging directions; and, consequently, they must cross each other, in the central point, and thus paint the objects behind upon the wall, in an inverted position.

It is in like manner, easy to conceive, that we see all objects double, whatever our present sensations may seem to tell us to the contrary. For to convince us of this, we have only to compare the situation of any one object on shutting one eye, and then compare the same situation by shutting the other. If, for instance, we hold up a finger and shut the right eye, we shall find it hide a certain part of the room; if again re-shutting the other eye, we shall find that part of the room visible, and the finger seeming to cover a part of the room that had been visible before. If we open both eyes, however, the part covered will appear to lie between the two extremes. But the truth is, we see the object our finger had covered, one image of it to the right, and the other to the left; but, from habit, suppose that we see but one image placed between both; our sense of feeling having corrected the error of sight. And thus, also, if instead of two eyes, we had two hundred, we should, at first, fancy the objects increased in proportion, until one sense had corrected the errors of another,

"The having two eyes might thus be said to be rather an inconvenience than a benefit; since one eye would answer the purposes of sight as well, and be less liable to illusion. But it is otherwise; two eyes greatly contribute, if not to distinct, at least to extensive vision.[2] When an object is placed at a moderate distance, by the means of both eyes

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perhaps, may wish that I had taken this liberty much more frequently. What I add is marked, as in a former instance, with inverted commas.

[2] Leonardo da Vinci.

see a larger share of it than we possibly could
ı one, the right eye seeing a greater portion of
ight side, and the left eye of its correspondent
. Thus both eyes, in some measure, see round
object; and it is this that gives it, in nature,
bold relievo, or swelling, with which they
ar; and which no painting, how exquisite
er, can attain to. The painter must be con-
ed with shading on a flat surface; but the
, in observing nature, do not behold the shad-
only, but a part of the figure also, that lies
ind these very shadings, which give it that
lling which painters so ardently desire, but
never fully imitate.

There is another defect, which either of the
taken singly would have, but which is cor-
ed, by having the organ double. In either
there is a point, which has no vision what-
er: so that if one of them only is employed
eing, there is a part of the object to which
always totally blind. This is that part of the
c nerve where its vein and artery run; which
g insensible, that point of the object that is
ted there must continue unseen. To be con-
ed of this we have only to try a very easy ex-
ment. If we take three black patches, and stick
n upon a white wall, about a foot distant from
ı other, each about as high as the eye that is
bserve them; then retiring six or seven feet
, and shutting one eye, by trying for some
, we shall find, that while we distinctly be-
l the black spots that are to the right and
that which is in the middle remains totally
een. Or, in other words, when we bring that
of the eye where the optic artery runs, to fall
n the object, it will then become invisible.
s defect, however, in either eye, is always cor-
ed by both, since the part of the object that
nseen by one, will be very distinctly perceiv-
by the other."

eside the former defects, we can have no idea
listances from the sight without the help of
h. Naturally every object we see appears to
within our eyes; and a child, who has as yet
le but little use of the sense of feeling, must
pose that every thing it sees makes a part of
lf. Such objects are only seen more or less
cy, as they approach or recede from its eyes;
hat a fly that is near will appear larger than
x at a distance. It is experience alone that
rectify this mistake; and a long aquaintance
h the real size of every object quickly assures
f the distance at which it is seen. The last
ı in a file of soldiers appears in reality much
, perhaps ten times more diminutive, than the
ı next to us; however, we do not perceive this
erence, but continue to think him of equal
ure; for the numbers we have seen thus less-
d by distance, and have found, by repeated
erience, to be of the natural size when we
e closer, instantly correct the sense, and
y object is perceived with nearly its natural
portion. But it is otherwise, if we observe objects in such situations as we have not had sufficient experience to correct the errors of the eye; if, for instance, we look at men from the top of a high steeple, they, in that case, appear very much diminished, as we have not had a habit of correcting the sense in that position.

Although a small degree of reflection will serve to convince us of the truth of these positions, it may not be amiss to strengthen them by an authority which cannot be disputed. Mr. Cheselden having couched a boy of thirteen for a cataract, who had hitherto been blind, and thus at once having restored him to sight, curiously marked the progress of his mind upon that occasion. This youth, though he had been till then incapable of seeing, yet was not totally blind, but could tell day from night, as persons in his situation always may. He could also, with a strong light, distinguish black from white, and either from the vivid colour of scarlet: however he saw nothing of the form of bodies; and without a bright light, not even colours themselves. He was at first couched only in one of his eyes; and when he saw for the first time, he was so far from judging of distances, that he supposed his eye touched every object that he saw, in the same manner as his hands might be said to feel them. The objects that were most agreeable to him were such as were of plain surfaces and regular figures: though he could as yet make no judgment whatever of their different forms, nor give a reason why one pleased him more than another. Although he could form some idea of colours during his state of blindness, yet that was not sufficient to direct him at present; and he could scarcely be persuaded that the colours he now saw were the same with those he had formerly conceived such erroneous ideas of. He delighted most in green; but black objects, as if giving him an idea of his former blindness, he regarded with horror. He had, as was said, no idea of forms; and was unable to distinguish one object from another, though never so different. When those things were shown him, which he had been formerly familiarized to by his feeling, he beheld them with earnestness, in order to remember them a second time; but as he had too many to recollect at once, he forgot the greatest number; and for one he could tell, after seeing, there was a thousand he was totally unacquainted with. He was very much surprised to find, that those things and persons he loved best, were not the most beautiful to be seen; and even testified displeasure in not finding his parents so handsome as he conceived them to be. It was near two months before he could find that a picture resembled a solid body. Till then he only considered it as a flat surface variously shadowed; but when he began to perceive that these kinds of shadings actually represented human beings, he then began to examine, by his touch, whether they had not the usual qualities of such bodies, and was greatly surprised to find, what he expected a very unequal surface, to be smooth and even. He was then shown a miniature-picture of his father, which was contained in his mother's watch-case, and he readily perceived the resemblance; but asked with great astonishment, how so large a face could be contained in so small a compass? It seemed as strange to him, as if a bushel was contained in a pint vessel. At first he could bear but a very small quantity of light, and he saw every object much greater than the life; but in proportion as he saw objects that were really large, he seemed to think the former were diminished; and although he knew the chamber where he was contained in the house, yet, until he saw the latter, he could not be brought to conceive how a house could be larger than a chamber. Before the operation, he had no great expectations from the pleasure he should receive from a new sense: he was only excited by the hopes of being able to read and write; he said, for instance, that he could have no greater pleasure in walking in the garden with his sight, than he had without it, for he walked there at his ease, and was acquainted with all the walks. He remarked also, with great justice, that his former blindness gave him one advantage over the rest of mankind, which was that of being able to walk in the night with confidence and security. But when he began to make use of his new sense, he seemed transported beyond measure. He said, that every new object was a new source of delight, and that his pleasure was so great as to be past expression. About a year after, he was brought to Epsom, where there is a very fine prospect, with which he seemed greatly charmed; and he called the landscape before him a new method of seeing. He was couched in the other eye, a year after the former, and the operation succeeded equally well: when he saw with both eyes, he said that objects appeared to him twice as large as when he saw but with one; however, he did not see them doubled, or, at least, he showed no marks as if he saw them so. Mr. Cheselden mentions instances of many more that were restored to sight in this manner; they all seemed to concur in their perceptions with this youth; and they all seemed particularly embarrassed in learning how to direct their eyes to the objects they wished to observe.

In this manner it is that our feeling corrects the sense of seeing, and that objects which appear of very different sizes at different distances, are all reduced, by experience, to their natural standard. "But not the feeling only, but also the colour and brightness of the object, contributes, in some measure, to assist us in forming an idea of the distance at which it appears.[3] Those which we see most strongly marked with light and shade, we readily know to be nearer than those on which the colours are more faintly spread, and that, in some measure, take a part of their hue from the air between us and them.—Bright objects also are seen at a greater distance than such as are obscure, and, most probably, for this reason, that being less similar in colour to the air which interposes, their impressions are less effaced by it, and they continue more distinctly visible. Thus a black and distant object is not seen so far off as a bright and glittering one, and a fire by night is seen much farther off than by day."

The power of seeing objects at a distance is very rarely equal in both eyes. When this inequality is in any great degree, the person so circumstanced then makes use only of one eye, shutting that which sees the least, and employing the other with all its power. And hence proceeds that awkward look which is known by the name of *strabism*.

There are many reasons to induce us to think that such as are near-sighted see objects larger than other persons; and yet the contrary is most certainly true, for they see them less. Mr. Buffon informs us that he himself is short-sighted, and that his left eye is stronger than his right. He has very frequently experienced, upon looking at any object, such as the letters of a book, that they appear less to the weakest eye; and that when he places the book, so as that the letters appear double, the images of the left eye, which is strongest, are greater than those of the right, which is the most feeble. He has examined several others, who were in similar circumstance, and has always found that the best eye saw every object the largest. This he ascribes to habit; for near-sighted people being accustomed to come close to the object, and view but a small part of it at a time, the habit ensues, when the whole of an object is seen, and it appears less to them than to others.

Infants having their eyes less than those of adults, must see objects also smaller in proportion. For the image formed on the back of the eye will be large, as the eye is capacious; and infants having it not so great, cannot have so large a picture of the object. This may be a reason also why they are unable to see so distinctly, or at such distances, as persons arrived at maturity.

Old men, on the contrary, see bodies close to them very indistinctly, but bodies at a great distance from them with more precision; and this may happen from an alteration in the coats, or perhaps, humours of the eye; and not, as is supposed, from their diminution. The cornea, for instance, may become too rigid to adapt itself, and take a proper convexity for seeing minute objects; and its very flatness will be sufficient to fit it for distant vision.

When we cast our eyes upon an object extremely brilliant, or when we fix and detain them too long upon the same object, the organ is hurt and fatigued, its vision becomes indistinct, and the image of the body which has thus too violently or preseveringly employed us, is painted upon every thing we look at, and mixes with every object that occurs. "And this is an obvious consequence of the eye taking in too much light, either immediately, or by reflection. Every body exposed to the light, for a time, drinks in a quantity of its rays, which being brought into darkness, it cannot instantly discharge. Thus the hand, if it be exposed to broad day-light for some time, and then immediately snatched into a dark room, will appear still luminous: and it will be some time before it is totally darkened. It is thus with the eye; which either by an instant gaze at the sun, or a steady continuance upon some less brilliant object, has taken in too much light; its humours are, for a while, unfit for vision, until that be discharged, and room made for rays of a mild nature." How dangerous the looking upon bright and luminous objects is to the sight may be easily seen, from such as live in countries covered for most part of the year with snow, who become generally blind before their time. Travellers who cross these countries are obliged to wear a crape before their faces, to save their eyes, which would otherwise be rendered totally unserviceable; and it is equally dangerous in the sandy plains of Africa. The reflection of the light is there so strong, that it is impossible to sustain the effect, without incurring the danger of losing one's sight entirely. Such persons, therefore, as read or write for any continuance, should choose a moderate light, in order to save their eyes; and although it may seem insufficient at first, the eye will accustom itself to the shade, by degrees, and be less hurt by the want of light than the excess.

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[3] Mr. Buffon gives a different theory, for which I must refer the reader to the original. That I have given, I take to be easy and satisfactory enough.

"It is, indeed, surprising how far the eye can accommodate itself to darkness, and make the best of a gloomy situation. When first taken from the light, and brought into a dark room, all things disappear; or, if any thing is seen, it is only the remaining radiations that still continue in the eye. But, after a very little time, when these are spent, the eye takes the advantage of the smallest ray that happens to enter; and this alone would, in time, serve for many of the purposes of life. There was a gentleman of great courage and understanding, who was a major under King Charles I.; this unfortunate man, sharing in his master's misfortunes, and being forced abroad, ventured at Madrid to do his king a signal service; but unluckily failed in the attempt. In consequence of this, he was instantly ordered to a dark and dismal dungeon, into which the light never entered, and into which there was no opening but by a hole at the top, down which the keeper put his provisions, and presently closed it again on the other side. In this manner the unfortunate loyalist continued for some weeks, distressed and disconsolate; but at last he began to think he saw some little glimmering of light. This internal dawn seemed to increase from time to time, so that he could not only discover the parts of his bed, and such other large objects, but, at length, he even began to perceive the mice that frequented his cell; and saw them as they ran about the floor, eating the crumbs of bread that happened to fall. After some months' confinement he was at last set free; but such was the effect of the darkness upon him, that he could not for some days venture to leave his dungeon, but was obliged to accustom himself by degrees to the light of the day."

CHAP. VIII.

OF HEARING.[1]

As the sense of hearing, as well as of sight, gives us notice of remote objects, so, like that, it is subject to similar errors, being capable of imposing on us upon all occasions, where we cannot rectify it by the sense of feeling. We can have from it no distinct intelligence of the distance from whence a sounding body is heard; a great noise far off, and a small one very near, produce the same sensation: and unless we receive information from some other sense, we can never distinctly tell whether the sound be a great or a small one. It is not till we have learned, by experience, that the particular sound which is heard, is of a peculiar kind; then we can judge of the distance from whence we hear it. When we know the tone of the bell, we can then judge how far it is from us.

Every body that strikes against another produces a sound, which is simple, and but one in bodies which are not elastic, but which is often repeated in such as are. If we strike a bell, or a stretched string, for instance, which are both elastic, a single blow produces a sound, which is repeated by the undulations of the sonorous body, and which is multiplied as often as it happens to undulate or vibrate. These undulations each strike their own peculiar blow: but they succeed so fast, one behind the other, that the ear supposes them one continued sound; whereas, in reality, they make many. A person who should, for the first time, hear the toll of the bell, would, very probably, be able to distinguish these breaks of sound; and, in fact, we can readily ourselves perceive an intension and remission in the sound.

In this manner, sounding bodies are of two kinds; those unelastic ones, which, being struck, return but a single sound; and those more elastic, returning a succession of sound; which uniting together form a tone. This tone may be considered as a great number of sounds, all produced one after the other, by the same body, as we find in a bell, or the string of a harpsichord, which continues to sound for some time after it is struck. A continuing tone may be also produced from a non-elastic body, by repeating the blow quick and often, as when we beat a drum, or when we draw a bow along the string of a fiddle.

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[1] This chapter is taken from Mr. Buffon, except where marked by inverted commas.

Considering the subject in this light, if we should multiply the number of blows, or repeat them at quicker intervals upon the sounding body, as upon the drum, for instance, it is evident that this will have no effect in altering the tone; it will only make it either more even, or more distinct. But it is otherwise, if we increase the force of the blow: if we strike the body with double weight, this will produce a tone twice as loud as the former. If, for instance, I strike a table with a switch, this will be very different from the sound produced by striking it with a cudgel. Hence, therefore, we may infer, that all bodies give a louder and graver tone, not in proportion to the number of times they are struck, but in proportion to the force that strikes them. And, if this be so, those philosophers who make the tone of a sonorous body, of a bell, or the string of a harpsichord, for instance, to depend upon the number only of its vibrations, and not the force, have mistaken what is only an effect for a cause. A bell, or an elastic string, can only be considered as a drum beaten; and the frequency of the blows can make no alteration whatever in the tone. The largest bells, and the longest and thickest strings, have the most forceful vibrations; and, therefore, their tones are the most loud and the most grave.

To know the manner in which sounds thus produced become pleasing, it must be observed, no one continuing tone, how loud or swelling soever, can give us satisfaction; we must have a succession of them, and those in the most pleasing proportion. The nature of this proportion may be thus conceived. If we strike a body incapable of vibration with a double force, or, what amounts to the same thing, with a double mass of matter, it will produce a sound that will be doubly grave. Music has been said by the ancients to have been first invented from the blows of different hammers on an anvil. Suppose then we strike an anvil with a hammer of one pound weight, and again with a hammer of two pounds, it is plain that the two-pound hammer will produce a sound twice as grave as the former. But if we strike with a two-pound hammer, and then with a three-pound, it is evident that the latter will produce a sound one-third more grave than the former. If we strike an anvil with a three-pound hammer, and then with a four-pound, it will likewise follow that the latter will be a quarter part more grave than the former. Now, in the comparing between all those sounds, it is obvious that the difference between one and two is more easily perceived, than between two and three, three and four, or any numbers succeeding in the same proportion. The succession of sounds will be, therefore, pleasing in proportion to the ease with which they may be distinguished. That sound which is double the former, or, in other words, the octave to the preceding tone, will, of all others, be the most pleasing. The next to that, which is as two to three, or, in other words, the third, will be most agreeable. And thus universally, those sounds whose difference may be most easily compared, are the most agreeable.

"Musicians, therefore, have contented themselves with seven different proportions of sound, which are called *notes*, and which sufficiently answer all the purposes of pleasure. Not but that they might adopt a greater diversity of proportions; and some have actually done so; but, in these, the differences of the proportion are so imperceptible, that the ear is rather fatigued than pleased in making the distinction. In order, however, to give variety, they have admitted half tones; but in all the countries where music is yet in its infancy, they have rejected such; and they can find music in none but the obvious ones. The Chinese, for instance, have neither flats nor sharps in their music; but the intervals between their other notes, are in the same proportion with ours.

"Many more barbarous nations have their peculiar instruments of music; and, what is remarkable, the proportion between their notes is in all the same as in ours. This is not the place for entering into the nature of these sounds, their effects upon the air, or their consonances with each other. We are not now giving a history of sound, but of human perception.

"All countries are pleased with music; and if they have not skill enough to produce harmony, at least they seem willing to substitute noise. Without all question, noise alone is sufficient to operate powerfully on the spirits; and, if the mind be already predisposed to joy, I have seldom found noise fail of increasing it into rapture. The mind feels a kind of distracted pleasure in such powerful sounds, braces up every nerve, and riots in the excess. But, as in the eye, an immediate gaze upon the sun will disturb the organs, so, in the ear, a loud unexpected noise disorders the whole frame, and sometimes disturbs the sense ever after. The mind must have time to prepare for the expected shock, and to give its organs the proper tension for its arrival.

"Musical sounds, however, seem of a different kind. Those are generally most pleasing which are most unexpected. It is not from bracing up the nerves, but from the grateful succession of the sounds, that these become so charming. There are few, how indifferent soever, but have at times felt their pleasing impression; and, perhaps, even those who have stood out against the powerful persuasion of sounds, only wanted the proper tune, or the proper instrument, to allure them.

"The ancients give us a thousand strange instances of the effects of music, upon men and nimals. The story of Arion's harp, that gathered ie dolphins to the ship side, is well known; id, what is remarkable, Schotteus assures us,[2] iat he saw a similar instance of fishes being lured by music. They tell us of diseases that ave been cured, unchastity corrected, seditions uelled, passions removed, and sometimes excited ven to madness. Dr. Wallis has endeavoured account for these surprising effects, by ascrib-g them to the novelty of the art. For my own rt, I can scarcely hesitate to impute them to ie exaggeration of their writers. They are as yperbolical in the effects of their oratory; and t we well know, there is nothing in the ora-ons which they have left us, capable of exciting adness, or of raising the mind to that un-vernable degree of fury which they describe. s they have exaggerated, therefore, in one in-ance, we may naturally suppose that they have ne the same in the other; and, indeed, from e few remains we have of their music, collected Meibomius, one might be apt to suppose there as nothing very powerful in what is lost. Nor es any one of the ancient instruments, such we see them represented in statues, appear mparable to our fiddle.

"However this be, we have many odd accounts, t only among them, but the moderns, of the wer of music; and it must not be denied, but at on some particular occasions, musical sounds ay have a very powerful effect. I have seen all e horses and cows in a field, where there were ove a hundred, gathered round a person that as blowing a French horn, and seeming to stify an awkward kind of satisfaction. Dogs e well known to be very sensible of different nes in music; and I have sometimes heard em sustain a very ridiculous part in a concert, here their assistance was neither expected nor sired.

"We are told of Henry IV. of Denmark,[3] that ing one day desirous of trying in person whether musician, who boasted that he could excite men madness, was not an impostor, he submitted the operation of his skill: but the consequence as much more terrible than he expected; for, coming actually mad, he killed four of his at-ndants in the midst of his transports. A con-ary effect of music we have,[4] in the cure of a adman of Alais, in France, by music. This an, who was a dancing-master, after a fever of e days, grew furious, and so ungovernable that hands were obliged to be tied to his sides: hat at first was rage, in a short time was con-rted into silent melancholy, which no arts could hilarate, nor no medicines remove. In this llen and dejected state, an old acquaintance cidentally came to inquire after his health; he und him sitting up in bed, tied, and totally regardless of every external object round him. Happening, however, to take up a fiddle that lay in the room, and touching a favourite air, the poor madman instantly seemed to brighten up at the sound; from a recumbent posture, he began to sit up; and, as the musician continued playing, the patient seemed desirous of dancing to the sound: but he was tied, and incapable of leaving his bed, so that he could only humour the tune with his head, and those parts of his arms which were at liberty. Thus the other continued playing, and the dancing-master practised his own art, as far as he was able, for about a quarter of an hour, when suddenly falling into a deep sleep, in which his disorder came to a crisis, he awaked perfectly recovered.[5]

"A thousand other instances might be added, equally true: let it suffice to add one more, which is not true; I mean that of the tarantula. Every person who has been in Italy now well knows, that the bite of that animal, and its being cured by music, is all a deception. When strangers come into that part of the country, the country people are ready enough to take money for dancing to the tarantula. A friend of mine had a servant who suffered himself to be bit; the wound, which was little larger than the puncture of a pin, was uneasy for a few hours, and then became well without any farther assistance. Some of the country people, however, still make a tolerable livelihood of the credulity of strangers, as the musician finds his account in it not less than the dancer."[6]

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[2] Quod oculis meis spectavi. Schotti Magic. uni-rsalis, pars ii. lib. 1. p. 26.

[3] Olai Magni, lib. 15. hist. c. 28.

[4] Hist. de l'Acad. 1708, p. 22.

[5] "Of the solace of music, nay, more, of its influence upon melancholy, I need not look for evidence in the universal testimony of antiquity, nor remind such an audience of its recorded effect upon the gloomy distemper of the perverse mind of Saul. I myself have witnessed its power to mitigate the sadness of seclusion, in a case where my loyalty as a good subject, and my best feelings as a man, were more than usually interested in the restoration of my patient; and I also remember its salutary operation in the case of a gentleman in Yorkshire many years ago, who was first stupified, and afterwards became insane upon the sudden loss of all his property. This gentleman could hardly be said to live—he merely vegetated, for he was motionless until pushed, and did not speak to, nor notice anybody in the house, for nearly four months. The first indication of a return of any sense appeared in his attention to music played in the street. This was observed, the second time he heard it, to have a more decided force in arousing him from his lethargy; and induced by this good omen, the sagacious humanity of his superintendent offered him a violin. He seized it eagerly, and amused himself with it constantly. After six weeks, hearing the rest of the patients of the house pass by his door to their common room, he accosted them, 'Good morning to you all, gentlemen, I am quite well, and desire I may accompany you.' In two months more he was dismissed cured."—*Sir Henry Halford.*

[6] "The Peccorara and Tarantella are the dances of Calabria: the latter is generally adopted throughout the kingdom of Naples. The music accompanying it is extravagant and without melody: it consists of some notes, the movement of which is always increasing, till it ends in producing a convulsive effort

Sounds, like light, are not only extensively diffused, but are frequently reflected. The laws of this reflection, it is true, are not as well understood as those of light; all we know is, that sound is principally reflected by hard bodies; and their being hollow, also, sometimes increases the reverberation. "No art, however, can make an echo; and some who have bestowed great labour and expense upon such a project, have only erected shapeless buildings, whose silence was a mortifying lecture upon their presumption."

The internal cavity of the ear seems to be fitted up for the purpose of echoing sound with the greatest precision. This part is fashioned out of the temporal bone, like a cavern cut into a rock. "In this the sound is repeated and articulated; and, as some anatomists tell us, (for we have as yet but little knowledge on this subject,) is beaten against the tympanum, or drum of the ear, which moves four little bones joined thereto; and these move and agitate the internal air which lies on the other side: and lastly, this air strikes and affects the auditory nerves, which carry the sound to the brain."

One of the most common disorders in old age is deafness; which probably proceeds from the rigidity of the nerves in the labyrinth of the ear. This disorder, also, sometimes proceeds from a stoppage of the wax, which art may easily remedy. In order to know whether the defect be an internal or an external one, let the deaf person put a repeating watch into his mouth, and if he hears it strike, he may be assured that his disorder proceeds from an external cause, and is, in some measure, curable: "for there is a passage from the ears into the mouth, by what anatomists call the *eustachian tube;* and, by this passage, people often hear sounds, when they are utterly without hearing through the larger channel: and this also is the reason that we often see persons who listen with great attention, hearken with their mouths open, in order to catch all the sound at every aperture."

It often happens, that persons hear differently with one ear from the other: and it is generally found that these have what is called, by musicians, *a bad ear.* Mr. Buffon, who has made many trials upon persons of this kind, always found that their defect in judging properly of sounds proceeded from the inequality of their ears; and receiving by both, at the same time, unequal sensations, they form an unjust idea. In this manner as those people hear false, they also, without knowing it, sing false. Those persons also frequently deceive themselves with regard to the side from whence the sound comes, generally supposing the noise to come on the part of the best ear.

Such as are hard of hearing, find the same advantage in the trumpet made for this purpose, that short-sighted persons do from glasses. These trumpets might be easily improved so as to increase sounds, in the same manner that the telescope does objects; however, they could be used to advantage only in a place of solitude and stillness, as the neighbouring sounds would mix with the more distant, and the whole would produce in the ear nothing but tumult and confusion.

Hearing is a much more necessary sense to man than to animals. With these it is only a warning against danger, or an encouragement to mutual assistance. In man, it is the source of most of his pleasures; and without which the rest of his senses would be of little benefit. A man born deaf, must necessarily be dumb; and his whole sphere of knowledge must be bounded only by sensual objects. We have an instance of a young man, who, being born deaf, was restored at the age of twenty-four to perfect hearing: the account is given in the Memoirs of the Academy of Sciences, 1703, page 18.

A young man, of the town of Chartres, between the age of twenty-three and twenty-four, the son of a tradesman, and deaf and dumb from his birth, began to speak all of a sudden to the great astonishment of the whole town. He gave them to understand, that about three or four months before, he had heard the sound of the bells for the first time, and was greatly surprised at this new and unknown sensation. After some time, a kind of water issued from his left ear, and he then heard perfectly well with both. During these three months, he was sedulously employed in listening, without saying a word, and accustoming himself to speak softly (so as not to be heard) the words pronounced by others. He laboured hard also in perfecting himself in the pronunciation, and in the ideas attached to every sound. At length, having supposed himself qualified to break silence, he declared, that he could now speak although as yet but imperfectly. Soon after, some able divines questioned him concerning his ideas of his past state; and principally with respect to God, his soul, the morality or turpitude of actions. The young man, however, had not driven his solitary speculations into that channel. He had gone to mass indeed with his parents, and learned to sign himself with the cross, to kneel down and assume all the grimaces of a man that was praying; but he did all this without any manner

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Two persons placed opposite to each other make, like a pair of savages, wild contortions and indecent gestures, which terminate in a sort of delirium. This dance, originating in the city of Tarentum, has given rise to the fable of the tarantula, whose venomous bite, it is pretended, can be cured only by music and hard dancing. Many respectable persons who have resided for a long time in the city of Tarentum, have assured me that they never witnessed any circumstance of the kind, and that it could be only attributed to the heat and insalubrity of the climate, which produce nervous affections that are soothed and composed by the charms of music. The tarantula is a species of spider that is to be found all over the south of Italy. The Calabrians do not fear it, and I have often seen our soldiers hold it in their hands without any bad effects ensuing."—*Calabria, during a Military Residence.*

of knowledge of the intention or the cause; he saw others do the like, and that was enough for him; he knew nothing even of death, and it never entered into his head; he led a life of pure animal instinct; entirely taken up with sensible objects, and such as were present, he did not seem even to make as many reflections upon these, as might reasonably be expected from his improving situation: and yet the young man was not in want of understanding; but the understanding of a man deprived of all commerce with others, is so very confined, that the mind is in some measure totally under the control of its immediate sensations.

Notwithstanding, it is very possible to communicate ideas to deaf men, which they previously wanted, and even give them very precise notions of some abstract subjects, by means of signs and of letters. A person born deaf, may, by time, and sufficient pains, be taught to write and read, to speak, and by the motions of the lips, to understand what is said to him; however, it is probable that, as most of the motions of speech are made within the mouth by the tongue, the knowledge from the motion of the lips is but very confined; "nevertheless, I have conversed with a gentleman thus taught, and in all the commonly occurring questions, and the usual salutations, he was ready enough, merely by attending to the motion of the lips alone.[7] When I ventured to speak for a short continuance, he was totally at a loss, although he understood the subject, when written, extremely well." Persons taught in this manner, were at first considered as prodigies; but there have been so many instances of success of late, and so many are skilful in the art of instructing in this way, that though still a matter of some curiosity, it ceases to be an object of wonder.[8]

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[7] Mr. Thomas Braidwood, late of Edinburgh, was perhaps the first who ever brought this surprising art to any degree of perfection. He began with a single pupil in 1764, and after that period taught great numbers of people born deaf, to speak distinctly, to read, to write, to understand figures, the principles of religion and morality, &c.

[8] Note.—*Case of James Mitchell.*

In the Transactions of the Royal Society of Edinburgh, Professor Stewart gives an interesting account of a boy born blind and deaf.

James Mitchell, the son of a clergyman lately deceased, in the county of Nairn in Scotland, was born on the 11th November, 1795. His mother soon noticed his blindness, from his discovering no desire to turn his eyes to the light, or to any bright object; and in early infancy also she ascertained his deafness, from observing that the loudest noises did not disturb his sleep. The deafness was from the beginning complete; but the defect of sight, as in other cases of cataract, did not amount to a total absence of vision. At the time of life when this boy began to walk, he seemed to be attracted by bright and dazzling colours; and though every thing connected with his history appears to prove that he derived little information from that organ, yet he received from it much sensual gratification. He used to hold between his eye and luminous objects, such bodies as he had found to increase, by their interposition, the quantity of light; and it was one of his chief amusements, to concentrate the sun's rays by means of pieces of glass, transparent pebbles, or similar substances, which he held between his eye and the light, and turned about in various directions. He early showed an extraordinary acuteness of the senses of touch and smell. When a stranger arrived, his smell immediately and invariably informed him of the circumstance, and directed him to the place where the stranger was, whom he proceeded to survey by the sense of touch. In the remote situation where he resided, male visitors were most frequent; and, therefore, the first thing he generally did, was to examine whether or not the stranger wore boots; if so, he immediately went to the lobby, felt for, and accurately examined his whip; then proceeded to the stable and handled his horse with great care, and with the utmost seeming attention. It occasionally happened, that visitors arrived in a carriage; and, on such occasions, he never failed to go to the place where the carriage stood, examined the whole of it with much anxiety, and tried innumerable times the elasticity of the springs. In all this he was undoubtedly guided by the smell and touch only. From his childhood he had been accustomed to strike his fore teeth with a key, or any instrument that gives a sharp sound. His chief pleasures were obviously derived from taste and smell; and he often eat with a disagreeable voracity. He found amusement also in the exercise of touch; and often employed himself for hours, in gathering from the bed of a river, round and smooth stones, which he afterwards arranged in a circular form, seating himself in the midst of the circle. He explored by touch a space of about two hundred yards round the parsonage, to every part of which he walked fearlessly, and without a guide; and scarcely a day elapsed in which he did not cautiously feel his way into ground which he had not explored before. In one of these excursions of discovery, his father observed him creeping on his hands and knees, along a narrow wooden bridge which crossed a neighbouring river, at a point where the stream was deep and rapid. He was immediately stopped; and to deter him from the repetition of such perilous experiments, he was once or twice plunged into the river, which had the desired effect. The servants were instructed to prevent his visits to the horses of strangers in the stable; and after his wishes in this respect had been repeatedly thwarted, he had the ingenuity to lock the door of the kitchen on the servants, in the hopes that he might accomplish unmolested his visits to the stable. The information of his understanding, and the guidance of his conduct, seemed entirely to depend either on touch, or on the organs of smell and taste, which, in perfectly formed men, have almost dwindled into mere instruments of sensual gratification. His docility and contrivance often indicated a degree of understanding which (if due allowance be made for his privations) was superior to that of many in whom every inlet is unobstructed through which the materials of knowledge enter the mind. He had received a severe wound in his foot, and during its cure, he usually sat by the fireside, with his foot resting on a small footstool. More than a year afterwards a servant boy with whom he used to play, was obliged to confine himself to a chair from a similar cause. Young Mitchell perceiving that his companion remained longer in one situation than he used to do, examined him attentively, and seemed quickly to discover by the bandages on his foot, the reason of his confinement. He immediately walked up stairs to a garret, sought out, amidst several other pieces of furniture, the little footstool which had formerly supported his own wounded limb, brought it down in his hand to the kitchen, and gently placed the servant boy's foot upon it.

Having appeared to distinguish, by feeling, a horse which his mother had sold a few weeks before, the rider dismounted to put his knowledge to the test, and Mitchell immediately led the horse to his mother's stable, took off his saddle and bridle, put corn before him, and then withdrew, locking the door, and putting the key in his pocket. He knew the use of most ordinary utensils; and was pleased with every addition which he made to this sort of knowledge. One of his amusements was, to visit the shops of carpenters and other mechanics, obviously with a view to understand the nature of their tools and operations. He assisted the farm servants, to whom he was attached, in their work, particularly in cleaning the stable. He himself endeavoured to repair breaches in the farm houses, and even attempted to build small houses with turf, leaving little openings like windows. Means were used to teach him to make baskets, but he seemed to want the perseverance necessary to finish his work.

His sister devised some means for establishing that communication between him and other beings, from which nature seemed for ever to have cut him off. By various modifications of touch, she conveyed to him her satisfaction or displeasure at his conduct. Touching his head with her hand was her principal method. This she did with various degrees of force, and in various manners; and he readily understood the intimation intended to be conveyed. When she signified her highest approbation, she patted him much, and cordially, on the head, back, or hand. This expression more sparingly used, signified simple assent; and she only refused him these signs of her approbation entirely, and repelled him gently, to convey to him in the most effectual manner the notice of her displeasure. In this manner she contrived a language of touch, which was not only the means of communication, but the instrument of some moral discipline. To supply its obvious and great defects she had recourse to a language of action, representing those ideas which none of the simple natural signs cognizable by the sense of touch could convey. When his mother was from home, his sister allayed his anxiety for her return, by laying his head gently down on a pillow once for each night that his mother was to be absent; implying that he would sleep so many times before her return. It was once signified to him that he must wait two days for a suit of new clothes, and this also was effectually done by shutting his eyes and bending down his head twice. In the mode of communicating his ideas to others, there was a very remarkable peculiarity. When he wished for meat, he pointed to the place where he knew it to be: and when he was desirous of informing his friends that he was going to a shoemaker's shop, he imitated the action of making shoes. But though no information was intentionally communicated to him without touching some part of his body, he did not attempt, in any of these cases, to touch that of others. To say that he addressed these signs to their sight would be incorrect; but he must have been conscious that they were endowed with some means of interpreting signs without contact, by an incomprehensible faculty which Nature had refused to him.

He seems to have had no conception of any beings superior to human, and was consequently without any appearance of those religious feelings which are among the most general characteristics of our species. His only attempts at utterance were the uncouth bellowings by which he sometimes laboured to vent that violent anger to which his situation rendered him prone. His tears were most commonly shed from disappointment in his wishes; but they sometimes flowed from affectionate sorrow. No account of any being, doomed from birth to a privation so nearly complete both of sight and hearing, has hitherto been discovered on the records of science. The case of Mitchell must therefore be regarded as among the most interesting anomalies in the natural history of the human species.

As the materials of all human thought and reasoning enter the mind, or arise in it at a period which is prior to the operation of memory, and under the simultaneous action of all the senses, it is extremely difficult to ascertain what perceptions belong originally and exclusively to each of the organs of external sense. Our notion of every object is made up of the impressions which it makes on all the organs. Whatever may be thought of the mental act which originally unites these various impressions, it seems evident, that, in the actual state of every human understanding, the labour is to disunite them. Every common man thinks of them, and employs them in their compound state. To analyze them is an operation suggested by philosophy; and which, in the usual state of things, must always be most imperfectly performed. A man who, from the beginning, had all his senses complete, must have had all these impressions; and never can banish any of them from his mind. He can indeed attend to some of them so much more than to others, that he may seem to himself to exclude altogether that which he neglects. But to the perceptions of which he is conscious much will adhere, composed of ingredients so minute and subtle, as to elude the power of will, and to escape the grasp of consciousness. He can approach analysis only by efforts of attention very imperfectly successful, and by suppositions often precarious; and when pressed to their ultimate consequences, often also repugnant and inconceivable. For such purposes some philosophers have imagined intelligent beings with no other sense but that of vision; and others have represented their own hypothesis respecting the origin and progress of perception under the history of a statue successively endowed with the various organs of sense. It is evident, however, that such suppositions can do no more than illustrate the peculiar opinions of the supposer, and cannot prove that which, in the nature of things, they presuppose. But when one inlet of perception is entirely blocked up, we then really see the variation in the state of the compound, produced by the absence of part of its ingredients; and hence it has happened, that the cure and education of the deaf and blind, besides their higher character among the triumphs of civilized benevolence, acquire a considerable though subordinate value, as almost the only great experiments which metaphysical philosophy can perform. Even these experiments are incomplete. Knowledge, opinion, and prejudice are infused into the blind through the ear; and when they are accustomed to employ the mechanism of language, they learn the use of words as signs of things unknown, and speak with coherence and propriety on subjects where they may have no ideas. To fix the limits of the thoughts of a blind man who hears and speaks, is a problem beyond the reach of our present attainments in philosophy.

CHAP. IX.

OF SMELLING, FEELING, AND TASTING.

AN animal may be said to fill up that sphere which he can reach by his senses; and is actually large in proportion to the sphere to which its organ extends. By sight, man's enjoyments are diffused into a wide circle; that of hearing, though less widely diffused, nevertheless extends his powers; the sense of smelling is more contracted still; and the taste and touch are the most confined of all. Thus man enjoys very distant objects but with one sense only; more nearly he brings two senses at once to bear upon them; his sense of smelling assists the other two at its own distance; and of such objects, as a man, he may be said to be in perfect possession.

Each sense, however, the more it acts at a distance, the more capable it is of making combinations; and is, consequently, the more improveable. Refined imaginations, and men of strong minds, take more pleasure, therefore, in improving the distant senses, than in enjoying such as are scarce capable of improvement.

By combining the objects of the extensive senses, all the arts of poetry, painting, and harmony, have been discovered; but the closer senses, if I may so call them, such as smelling, tasting, and touching, are, in some measure, as simple as they are limited, and admit of little variety. The man of imagination makes a great and an artificial happiness by the pleasure of altering and combining; the sensualist just stops where he began, and cultivates only those pleasures which he cannot improve. The sensualist is contented with those enjoyments that are already made to his hand; but the man of pleasure is best pleased with growing happiness.

Of all the senses, perhaps, there is not one in which man is more inferior to other animals than in that of smelling. With man, it is a sense that acts in a narrow sphere, and disgusts almost as frequently as it gives him pleasure. With many other animals it is diffused to a very great extent; and never seems to offend them. Dogs not only trace the steps of other animals, but also discover them by the scent at a very great distance; and while they are thus exquisitely sensible of all smells, they seem no way disgusted by any.

But, although this sense is, in general, so very inferior in man, it is much stronger in those nations that abstain from animal food than among Europeans. The Bramins of India have a power of smelling, as I am informed, equal to what it is in most other creatures. They can smell the water which they drink, that to us seems quite inodorous; and have a word, in their language, which denotes a country of fine water. We are told also, that the negroes of the Antilles, by the smell alone, can distinguish between the footsteps of a Frenchman and a negro. It is possible, therefore, that we may dull this organ by our luxurious way of living; and sacrifice to the pleasures of taste those which might be received from perfume.

However, it is a sense that we can, in some measure, dispense with; and I have known many that wanted it entirely, with but very little inconvenience from its loss. In a state of nature it is said to be useful in guiding us to proper nourishment, and deterring us from that which is unwholesome; but, in our present situation, such information is but little wanted; and, indeed, but little attended to. In fact, the sense of smelling gives us very often false intelligence. Many things that have a disagreeable odour, are, nevertheless, wholesome and pleasant to the taste; and such as make eating an art, seldom think a meal fit to please the appetite, till it begins to offend the nose. On the other hand, there are many things that smell most gratefully, and yet are noxious, or fatal to the constitution. Some physicians think that perfumes in general are unwholesome; that they relax the nerves, produce headaches, and even retard digestion. The manchineel apple, which is known to be deadly poison, is possessed of the most grateful odour. Some of those mineral vapours that are often found fatal in the stomach, smell like the sweetest flowers, and continue thus to flatter till they destroy. This sense, therefore, as it should seem, was never meant to direct us in the choice of food, but appears rather as an attendant than a necessary pleasure.

Indeed, if we examine the natives of different countries, or even different natives of the same, we shall find no pleasure in which they differ so widely as in that of smelling. Some persons are pleased with the smell of a rose: while I have known others that could not abide to have it approach them. The savage nations are highly delighted with the smell of assafœtida, which is to us the most nauseous stink in nature. It would in a manner seem that our delight in perfumes was made by habit; and that a very little industry could bring us totally to invert the perception of odours.

Thus much is certain, that many bodies which at one distance are an agreeable perfume, when nearer are a most ungrateful odour. Musk and ambergris, in small quantities, are considered by most persons as highly fragrant; and yet when in larger masses, their scent is insufferable. From a mixture of two bodies, each whereof is, of itself, void of all smell, a very powerful smell may be drawn Thus, by grinding quick-lime with sal-ammoniac, may be produced a very fœtid mixture. On the contrary, from a mixture of two bodies, that are separately disagreeable, a very pleasant aromatic odour may be gained. A mixture of aqua-fortis with spirit of wine produces this effect. But not only the alterations of bodies by each other, but the smallest change in us, makes a very great alteration in this sense, and frequently deprives us of it totally. A slight cold often hinders us from smelling; and as often changes the nature of odours. Some persons, from disorder, retain an incurable aversion to those smells which most pleased them before: and many have been known to have an antipathy to some animals, whose presence they instantly perceived by the smell. From all this, therefore, the sense of smelling appears to be an uncertain monitor, easily disordered, and not much missed when totally wanting.

The sense most nearly allied to smelling is

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that of tasting. This some have been willing to consider merely as a nicer kind of touch, and have undertaken to account, in a very mechanical manner, for the difference of savours. "Such bodies," say they, "as are pointed, happening to be applied to the papillæ of the tongue, excite a very powerful sensation, and give us the idea of saltness. Such, on the contrary, as are of a rounder figure, slide smoothly along the papillæ, and are perceived to be sweet." In this manner, they have with minute labour, gone through the variety of imagined forms in bodies, and have given them as imaginary effects. All we can precisely determine upon the nature of tastes is, that the bodies to be tasted must be either somewhat moistened, or, in some measure, dissolved by the saliva, before they can produce a proper sensation: when both the tongue itself and the body to be tasted are extremely dry, no taste whatever ensues. The sensation is then changed; and the tongue, instead of tasting, can only be said, like any other parts of the body, to feel the object.

It is for this reason that children have a stronger relish of taste than those who are more advanced in life. This organ with them, from the greater moisture of their bodies, is kept in greater perfection; and is, consequently, better adapted to perform its functions. Every person remembers how great a pleasure he found in sweets, while a child; and his taste growing more obtuse with age, he is obliged to use artificial means to excite it. It is then that he is found to call in the assistance of poignant sauces, and strong relishes of salts and aromatics; all which the delicacy of his tender organ in childhood was unable to endure. His taste grows callous to the natural relishes, and is artificially formed to others more unnatural; so that the highest epicure may be said to have the most depraved taste; as it is owing to the bluntness of his organs, that he is obliged to have recourse to such a variety of expedients to gratify his appetite.

As smells are often rendered agreeable by habit, so also tastes may be. Tobacco and coffee, so pleasing to many, are yet, at first, very disagreeable to all. It is not without perseverance that we begin to have a relish for them; we force nature so long, that what was constraint in the beginning, at last becomes inclination.

The grossest, and yet the most useful of all the senses, is that of feeling. We are often seen to survive under the loss of the rest; but of this we can never totally be deprived, but with life. Although this sense is diffused over all parts of the body, yet it most frequently happens that those parts which are most exercised in touching, acquire the greatest degree of accuracy. Thus the fingers, by long habit, become greater masters in the art than any others, even where the sensation is more delicate and fine.[1] It is from this habit, therefore, and their peculiar formation, and not, as is supposed, from their being furnished with a great quantity of nerves, that the fingers are thus perfectly qualified to judge of forms. Blind men, who are obliged to use them much oftener, have this sense much finer; so that the delicacy of the touch arises rather from the habit of constantly employing the fingers, than from any fancied nervousness in their conformation.

All animals that are furnished with hands[2] seem to have more understanding than others. Monkeys have so many actions like those of men, that they appear to have similar ideas of the form of bodies. All other creatures, deprived of hands, can have no distinct ideas of the shape of the objects by which they are surrounded, as they want this organ, which serves to examine and measure their forms, their risings, and depressions. A quadruped, probably, conceives as erroneous an idea of any thing near him, as a child would of a rock or a mountain that it beheld at a distance.

It may be for this reason, that we often see them frighted at things with which they ought to be better acquainted. Fishes, whose bodies are covered with scales, and who have no organs for feeling, must be the most stupid of all animals. Serpents, that are likewise destitute, are yet, by winding round several bodies, better capable of judging of their form. All these, however, can have but very imperfect ideas from feeling; and we have already seen, when deprived of this sense, how little the rest of the senses are to be relied on.

The feeling, therefore, is the guardian, the judge, and the examiner of all the rest of the senses. It establishes their information, and detects their errors. All the other senses are altered by time, and contradict their former evidence; but the touch still continues the same; and, though extremely confined in its operations, yet it is never found to deceive. The universe, to a man who had only used the rest of his senses, would be but a scene of illusion; every object misrepresented, and all its properties unknown. Mr. Buffon has imagined a man just newly brought into existence, describing the allusion of his first sensations, and pointing out the steps by which he arrived at reality. He considers him as just created, and awaking amidst the productions of nature; and, to animate the narrative still more strongly, has made his philosophical man a speaker. The reader will no doubt recollect Adam's speech in Milton as being similar. All that I can say to obviate the imputation of plagiarism is, that the one treats the subject more as a poet, the other more as a philosopher. The philosopher's man describes his first sensations in the following manner:[3]

"I well remember that joyful anxious moment when I first became acquainted with my own existence. I was quite ignorant of what I was, how I was produced, or from whence I came. I opened my eyes; what an addition to my surprise! the light of the day, the azure vault of heaven, the verdure of the earth, the crystal of the waters, all employed me at once, and animated and filled me with inexpressible delight. I at first imagined that all those objects were within me, and made a part of myself.

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[1] Buffon, vol. vi. p. 80.

[2] Buffon, vol. vi. p. 82.

[3] Ibid. vol. vi. p. 83.

"Impressed with this idea, I turned my eyes to the sun; its splendour dazzled and overpowered me; I shut them once more; and, to my great concern, I supposed that during this short interval of darkness, I was again returning to nothing.

"Afflicted, seized with astonishment, I pondered a moment on this great change, when I heard a variety of unexpected sounds. The whistling of the wind, and the melody of the grove, formed a concert, the soft cadence of which sunk upon my soul. I listened for some time, and was persuaded that all this music was within me.

"Quite occupied with this new kind of existence, I had already forgotten the light, which was my first inlet into life; when I once more opened my eyes, and found myself again in possession of my former happiness. The gratification of the two senses at once, was a pleasure too great for utterance.

"I turned my eyes upon a thousand various objects; I soon found that I could lose them, and restore them at will; and amused myself more at leisure with a repetition of this new-made power.

"I now began to gaze without emotion, and to hearken with tranquillity, when a light breeze, the freshness of which charmed me, wafted its perfumes to my sense of smelling, and gave me such satisfaction as even increased my self-love.

"Agitated, roused by the various pleasures of my new existence, I instantly arose, and perceived myself moving along, as if by some unknown and secret power.

"I had scarcely proceeded forward, when the novelty of my situation once more rendered me immoveable. My surprise returned; I supposed that every object around me had been in motion: I gave to them that agitation which I produced by changing place; and the whole creation seemed once more in disorder.

"I lifted my hand to my head; I touched my forehead; I felt my whole frame: I then supposed that my hand was the principal organ of my existence; all its informations were distinct and perfect, and so superior to the senses I had yet experienced, that I employed myself for some time in repeating its enjoyments; every part of my person I touched, seemed to touch my hand in turn; and gave back sensation for sensation.

"I soon found that this faculty was expanded over the whole surface of my body; and I now first began to perceive the limits of my existence, which I had in the beginning supposed spread over all the objects I saw.

"Upon casting my eyes upon my body, and surveying my own form, I thought it greater than all the objects that surrounded me. I gazed upon my person with pleasure; I examined the formation of my hand, and all its motions; it seemed to me large or little in proportion as I approached it to my eyes; I brought it very near, and it then hid almost every other object from my sight. I began soon, however, to find that my sight gave me uncertain information, and resolved to depend upon my feeling for redress.

"This precaution was of the utmost service; I renewed my motions, and walked forward with my face turned towards the heavens. I happened to strike lightly against a palm-tree, and this renewed my surprise; I laid my hand on this strange body; it seemed replete with new wonders, for it did not return me sensation for sensation, as my former feelings had done. I perceived that there was something external, and which did not make a part of my own existence.

"I now, therefore, resolved to touch whatever I saw, and vainly attempted to touch the sun; I stretched forth my arm, and felt only yielding air: at every effort, I fell from one surprise into another, for every object appeared equally near me; and it was not till after an infinity of trials, that I found some objects farther removed than the rest.

"Amazed with the illusions, and the uncertainty of my state, I sat down beneath a tree; the most beautiful fruits hung upon it within my reach; I stretched forth my hand, and they instantly separated from the branch. I was proud of being able to grasp a substance without me; I held them up, and their weight appeared to me like an animated power, that endeavoured to draw them to the earth. I found a pleasure in conquering their resistance.

"I held them near my eye; I considered their form and beauty; their fragrance still more allured me to bring them nearer; I approached them to my lips, and drank in their odours; the perfume invited my sense of tasting, and I soon tried a new sense—How new! how exquisite! Hitherto I had tasted only of pleasure; but now it was luxury. The power of tasting gave me the idea of possession.

"Flattered with this new acquisition, I continued its exercise, till an agreeable languor stealing upon my mind, I felt all my limbs become heavy, and all my desires suspended. My sensations were now no longer vivid and distinct; but seemed to lose every object, and presented only feeble images, confusedly marked. At that instant I sunk upon the flowery bank, and slumber seized me. All now seemed once more lost to me. It was then as if I was returning into my former nothing. How long my sleep continued, I cannot tell; as I yet had no perception of time. My awaking appeared like a second birth; and

I then perceived that I had ceased for a time to exist. This produced a new sensation of fear; and from this interruption in life, I began to conclude that I was not formed to exist for ever.

"In this state of doubt and perplexity, I began to harbour new suspicions; and to fear that sleep had robbed me of some of my late powers; when turning on one side, to resolve my doubts, what was my amazement, to behold another being like myself stretched by my side! New ideas now began to arise; new passions, as yet unperceived, with fears and pleasures, all took possession of my mind, and prompted my curiosity: love served to complete that happiness which was begun in the individual; and every sense was gratified in all its varieties."

CHAP. X.

OF OLD AGE AND DEATH.[1]

Every thing in nature has its improvement and decay. The human form is no sooner arrived at its state of perfection, than it begins to decline. The alteration is at first insensible; and often several years are elapsed before we find ourselves grown old. The news of this disagreeable change too generally comes from without; and we learn from others that we grow old, before we are willing to believe the report.

When the body has come to its full height, and is extended into its just dimensions, it then also begins to receive an additional bulk which rather loads than assists it. This is formed from fat; which generally at the age of thirty-five, or forty, covers all the muscles, and interrupts their activity. Every action is then performed with greater labour, and the increase of size only serves as a forerunner of decay.

The bones also become every day more solid. In the embryo they are as soft almost as the muscles of the flesh; but by degrees they harden, and acquire their natural vigour; but still, however, the circulation is carried on through them, and how hard soever the bones may seem, yet the blood holds its current through them, as through all other parts of the body. Of this we may be convinced by an experiment, which was first accidentally discovered by our ingenious countryman, Mr. Belcher. Perceiving at a friend's house, that the bones of hogs, which were fed upon madder, were red, he tried it upon various animals by mixing this root with their usual food; and he found that it tinctured the bones in all; an evident demonstration that the juices of the body had a circulation through the bones. He fed some animals alternately upon madder and their common food, for some time, and he found their bones tinctured with alternate layers, in conformity to their manner of living. From all this he naturally concluded, that the blood circulated through the bones, as it does through every other part of the body; and that, how solid soever they seemed, yet like the softest parts, they were furnished through all their substance with their proper canals. Nevertheless, these canals are of very different capacities, during the different stages of life. In infancy they are capacious; and the blood flows almost as freely through the bones as through any other part of the body; in manhood their size is greatly diminished; the vessels are almost imperceptible; and the circulation through them is proportionably slow. But, in the decline of life, the blood which flows through the bones, no longer contributing to their growth, must necessarily serve to increase their hardness. The channels that everywhere run through the human frame, may be compared to those pipes that we everywhere see crusted on the inside, by the water for a long continuance running through them. Both every day grow less and less, by the small rigid particles which are deposited within them. Thus as the vessels are by degrees diminished, the juices also, which were necessary for the circulation through them are diminished in proportion; till at length, in old age, those props of the human frame are not only more solid, but more brittle.

The cartilages, or gristles, which may be considered as bones beginning to be formed, grow also more rigid. The juices circulating through them, for there is a circulation through all parts of the body, every day contribute to render them harder; so that these substances, which in youth are elastic and pliant, in age become hard and bony. As these cartilages are generally placed near the joints, the motion of the joints also must of consequence become more difficult. Thus, in old age, every action of the body is performed with labour; and the cartilages, formerly so supple, will now sooner break than bend.

"As the cartilages acquire hardness, and unfit the joints for motion, so also that mucous liquor, which is always separated between the joints, and which serves, like oil to a hinge, to give them an easy and ready play, is now grown more scanty. It becomes thicker and more clammy, more unfit for answering the purposes of motion; and from thence, in old age, every joint is not only stiff, but awkward. At every motion this clammy liquor is heard to crack; and it is not without the greatest effort of the muscles that its resistance is overcome. I have seen an old person, who never moved a single joint, that did not thus give notice of the violence done to it."

The membranes that cover the bones, the joints, and the rest of the body, become, as we grow old, more dense and more dry. Those which surround the bones, soon cease to be ductile. The fibres, of which the muscles or flesh is composed, become every day more rigid; and while to the touch the body seems, as we advance in years, to grow softer, it is, in reality, increasing in hardness. It is the skin, and not the flesh, that we feel upon such occasions. The fat, and the flabbiness of that, seems to give an appearance of softness, which the flesh itself is very far from having. There are few can doubt this, after trying the difference between the flesh of young and old animals. The first is soft and tender, the last is hard and dry.

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[1] This chapter is taken from Mr. Buffon, except where it is marked by inverted commas.

The skin is the only part of the body that age does not contribute to harden. That stretches to every degree of tension; and we have horrid instances of its pliancy, in many disorders incident to humanity. In youth, therefore, while the body is vigorous and increasing, it still gives way to its growth. But, although it thus adapts itself to our increase; in does not in the same manner conform to our decay. The skin, which, in youth, was filled and glossy, when the body begins to decline, has not elasticity enough to shrink entirely with its diminution. It hangs therefore in wrinkles, which no art can remove. The wrinkles of the body, in general, proceed from this cause. But those of the face seem to proceed from another; namely, from the many varieties of positions into which it is put by the speech, the food, or the passions. Every grimace, and every passion, wrinkles up the visage into different forms. These are visible enough in young persons; but what at first was accidental or transitory, becomes unalterably fixed in the visage as it grows older. "From hence we may conclude, that a freedom from passions not only adds to the happiness of the mind, but preserves the beauty of the face; and the person that has not felt their influence, is less strongly marked by the decays of nature."

Hence, therefore, as we advance in age, the bones, the cartilages, the membranes, the flesh, the skin, and every fibre of the body, become more solid, more brittle, and more dry. Every part shrinks, every motion becomes more slow; the circulation of the fluids is performed with less freedom; perspiration diminishes; the secretions alter; the digestion becomes slow and laborious; and the juices no longer serving to convey their accustomed nourishment, those parts may be said to live no longer when the circulation ceases. Thus the body dies by little and little; all its functions are diminished by degrees; life is driven from one part of the frame to another; universal rigidity prevails; and death at last seizes upon the little that is left.

As the bones, the cartilages, the muscles, and all other parts of the body, are softer in women than in men, these parts must, of consequence, require a longer time to come to that hardness which hastens death. Women, therefore, ought to be a longer time in growing old than men; and this is actually the case. If we consult the tables which have been drawn up respecting human life, we shall find that, after a certain age, they are more long-lived than men, all other circumstances the same. A woman of sixty has a better chance than a man of the same age to live till eighty. Upon the whole, we may infer, that such persons as have been slow in coming up to maturity, will also be slow in growing old; and this holds as well with regard to other animals as to man.

The whole duration of the life of either vegetables or animals, may be, in some measure, determined from their manner of coming to maturity. The tree or the animal, which takes but a short time to increase to its utmost pitch, perishes much sooner than such as are less premature. In both the increase upwards is first accomplished; and not till they have acquired their greatest degree of height do they begin to spread in bulk. Man grows in stature till about the age of seventeen; but his body is not completely developed till about thirty. Dogs, on the other hand, are at their utmost size in a year, and become as bulky as they usually are in another. However, man, who is so long in growing, continues to live fourscore or a hundred years; but the dogs seldom above twelve or thirteen. In general also it may be said, that large animals live longer than little ones, as they usually take a longer time to grow. But in all animals one thing is equally certain, that they carry the causes of their own decay about them; and that their deaths are necessary and inevitable. The prospects which some visionaries have formed of perpetuating life by remedies, have been often enough proved false by their own example. Such unaccountable schemes would, therefore, have died with them, had not the love of life always augmented our credulity.

When the body is naturally well formed, it is possible to lengthen out the period of life for some years by management. Temperance in diet is often found conducive to this end. The famous Cornaro, who lived to above a hundred years, although his constitution was naturally feeble, is a strong instance of the benefit of an abstemious life. Moderation in the passions also may contribute to extend the term of our existence. "Fontenelle, the celebrated writer, was naturally of a very weak and delicate habit of body. He was affected by the smallest irregularities; and had frequently suffered severe fits of illness from the slightest causes. But the remarkable equality of his temper, and his seeming want of passion, lengthened out his life to above a hundred. It was remarkable of him, that nothing could vex or make him uneasy; every occurrence seemed equally pleasing; and no event, however unfortunate, seemed to come unexpected." However, the term of life can be prolonged but for a very little time by any art we can use. We are told of men who have lived beyond the ordinary duration of human existence: such as Parr, who lived to a hundred and forty-four; and Jenkins, to a hundred and sixty-five; yet these men used no peculiar arts to prolong life; on the contrary, it appears that these, as well as others, remarkable for their longevity, were peasants accustomed to the greatest fatigues, who had no settled rules of diet, but who often indulged in accidental excesses. Indeed, if we consider that the European, the Negro, the Chinese, and the American, the civilized man and the savage, the rich and the poor, the inhabitant of the city and of the country, though all so different in other respects, are yet entirely similar in the period allotted them for living; if we consider that neither the difference of race, of climate, of nourishment, of convenience, or of soil, makes any difference in the term of life; if we consider that those men who live upon raw flesh or dried fishes, upon sago or rice, upon cassava or upon roots, nevertheless live as long as those who are fed upon bread and meat; we shall readily be brought to acknowledge, that the duration of life depends neither upon habit, customs, nor the quantity of food; we shall confess, that nothing can change the laws of that mechanism which regulates the number of our years, and which can chiefly be affected only by long fasting, or great excess.

If there be any difference in the different periods of man's existence, it ought principally to be ascribed to the quality of the air. It has been observed, that in elevated situations there have been found more old people than in those that were low. The mountains of Scotland, Wales, Auvergne, and Switzerland, have furnished more instances of extreme old age, than the plains of Holland, Flanders, Germany, or Poland. But, in general, the duration of life is nearly the same in most countries. Man, if not cut off by accidental diseases, is often found to live to ninety or a hundred years. Our ancestors did not live beyond that date: and, since the times of David, this term has undergone little alteration.

If we be asked, how in the beginning men lived so much longer than at present, and by what means their lives were extended to nine hundred and thirty, or even nine hundred and sixty years; it may be answered, that the productions of the earth, upon which they fed, might be of a different nature at that time from what they are at present. "It may be answered, that the term was abridged by Divine command, in order to keep the earth from being overstocked with human inhabitants; since, if every person were now to live and generate for nine hundred years, mankind would be increased to such a degree, that there would be no room for subsistence: so that the plan of providence would be altered: which is seen not to produce life without providing a proper supply."

But to whatever extent life may be prolonged, or however some may have delayed the effects of age, death is the certain goal to which all are hastening. All the causes of decay which have been mentioned contribute to bring on this dreaded dissolution. However, nature approaches to this awful period by slow and imperceptible degrees; life is consuming day after day; and some one of our faculties, or vital principles, is every hour dying before the rest; so that death is only the last shade in the picture; and it is probable that man suffers a greater change in going from youth to age, than from age into the grave. When we first begin to live, our lives may scarcely be said to be our own; as the child grows, life increases in the same proportion; and is at its height in the prime of manhood. But as soon as the body begins to decrease, life decreases also; for as the human frame diminishes, and its juices circulate in smaller quantity, life diminishes and circulates with less vigour; so that as we begin to live by degrees, we begin to die in the same manner.

Why then should we fear death, if our lives have been such as not to make eternity dreadful? Why should we fear that moment, which is prepared by a thousand other moments of the same kind? the first pangs of sickness being probably greater than the last struggles of departure. Death, in most persons, is as calmly endured as the disorder that brings it on. If we inquire from those whose business it is to attend the sick and the dying, we shall find that, except in a very few acute cases, where the patient dies in agonies, the greatest number die quietly, and seemingly without pain: and even the agonies of the former rather terrify the spectators than torment the patient; for how many have we not seen who have been accidentally relieved from this extremity, and yet had no memory of what they then endured? In fact, they had ceased to live during that time when they ceased to have sensation; and their pains were only those of which they had an idea.

The greatest number of mankind die, therefore, without sensation; and of those few that still preserve their faculties entire to the last moment, there is scarcely one of them that does not also preserve the hopes of still outliving his disorder. Nature, for the happiness of man, has rendered this sentiment stronger than his reason. A person dying of an incurable disorder, which he must know to be so, by frequent examples of his case; which he perceives to be so, by the inquietude of all around him, by the tears of his friends, and the departure of the face of the physician, is, nevertheless, still in hopes of getting over it. His interest is so great, that he only attends to his own representations; the judgment of others is considered as a hasty conclusion; and while death every moment makes new inroads upon his constitution, and destroys life in some part, hope still seems to escape the universal ruin, and is the last that submits to the blow.

Cast your eyes upon a sick man, who has a hundred times told you that he felt himself dying, that he was convinced he could not recover, and that he was ready to expire; examine what passes on his visage, when, through zeal or indiscretion, any one comes to tell him that his end is at hand. You will see him change, like one who is told an unexpected piece of news. He now appears not to have thoroughly believed what he had been telling you himself: he doubted much; and his fears were greater than his hopes; but he still had some feeble expectations of living, and would not have seen the approaches of death, unless he had been alarmed by the mistaken assiduity of his attendants.

Death, therefore, is not that terrible thing which we suppose it to be. It is a spectre which frights us at a distance, but which disappears when we come to approach it more closely. Our ideas of its terrors are conceived in prejudice, and dressed up by fancy: we regard it not only as the greatest misfortune, but as also an evil accompanied with the most excruciating tortures; we have even increased our apprehensions, by reasoning on the extent of our sufferings. "It must be dreadful," say some, "since it is sufficient to separate the soul from the body: it must be long, since our sufferings are proportioned to the succession of our ideas; and these being painful, must succeed each other with extreme rapidity." In this manner has false philosophy laboured to augment the miseries of our nature; and to aggravate that period which Nature has kindly covered with insensibility. Neither the mind nor the body can suffer these calamities: the mind is, at that time, mostly without ideas; and the body too much enfeebled to be capable of perceiving its pain. A very acute pain produces either death or fainting, which is a state similar to death: the body can suffer but to a certain degree; if the torture become excessive, it destroys itself; and the mind ceases to perceive, when the body can no longer endure.

In this manner, excessive pain admits of no reflection; and wherever there are any signs of it, we may be sure that the sufferings of the patient are no greater than what we ourselves may have remembered to endure.

But, in the article of death, we have many instances in which the dying person has shown that very reflection which presupposes an absence of the greatest pain; and, consequently, that pang which ends life cannot even be so great as those which have preceded. Thus, when Charles XII. was shot at the siege of Frederickshall, he was seen to clap his hand on the hilt of his sword; and although the blow was great enough to terminate one of the boldest and bravest lives in the world, yet it was not painful enough to destroy reflection. He perceived himself attacked; he reflected that he ought to defend himself; and his body obeyed the impulse of his mind, even in the last extremity. Thus it is the prejudice of persons in health, and not the body in pain, that makes us suffer from the approach of death; we have all our lives contracted a habit of making out excessive pleasures and pains; and nothing but repeated experience shows us how seldom the one can be suffered, or the other enjoyed to the utmost.

If there be anything necessary to confirm what we have said concerning the gradual cessation of life, or the insensible approaches of our end, nothing can more effectually prove it than the uncertainty of the signs of death. If we consult what Winslow or Bruhier have said upon this subject we shall be convinced, that between life and death the shade is so very undistinguishable, that even all the powers of art can scarcely determine where the one ends, and the other begins. The colour of the visage, the warmth of the body, the suppleness of the joints, are but uncertain signs of life still subsisting; while on the contrary, the paleness of the complexion, the coldness of the body, the stiffness of the extremities, the cessation of all motion, and the total insensibility of the parts, are but uncertain marks of death begun. In the same manner, also, with regard to the pulse and the breathing, these motions are often so kept under, that it is impossible to perceive them. By approaching a looking-glass to the mouth of the person supposed to be dead, people often expect to find whether he breathes or not. But this is a very uncertain experiment; the glass is frequently sullied by the vapour of the dead man's body; and often the person is still alive although the glass is no way tarnished. In the same manner, neither burning nor scarifying, neither noises in the ears nor pungent spirits applied to the nostrils, give certain signs of the discontinuance of life; and there are many instances of persons who have endured them all, and afterwards recovered without any external assistance, to the astonishment of the spectators. How careful, therefore, should we be, before we commit those who are dearest to us to the grave, to be well assured of their departure: experience, justice, humanity, all persuade us not to hasten the funerals of our friends, but to keep their bodies unburied, until we have certain signs of their real decease.

CHAP. XI.

OF THE VARIETIES IN THE HUMAN RACE.

Hitherto we have compared man with other animals; we now come to compare men with each other. We have hitherto considered him as an individual, endowed with excellencies above the rest of the creation; we now come to consider the advantages which men have over men, and the various kinds with which our earth is inhabited.

If we compare the minute differences of mankind, there is scarce one nation upon the earth that entirely resembles another; and there may be said to be as many different kinds of men as there are countries inhabited. One polished nation does not differ more from another, than the merest savages do from those savages that lie even contiguous to them; and it frequently happens that a river or a mountain, divides two barbarous tribes that are unlike each other in manners, customs, features, and complexion. But these differences, however perceivable, do not form such distinctions as come within a general picture of the varieties of mankind. Custom, accident, or fashion, may produce considerable alterations in neighbouring nations; their being derived from ancestors of a different climate, or complexion, may contribute to make accidental distinctions, which every day grow less; and it may be said, that two neighbouring nations, how unlike soever at first, will assimilate by degrees; and by long continuance, the difference between them will at last become almost imperceptible. It is not, therefore, between contiguous nations we are to look for any strong marked varieties in the human species; it is by comparing the inhabitants of opposite climates and distant countries; those who live within the polar circles, with those beneath the equator; those that live on one side of the globe, with those that occupy the other.

Of all animals, the differences between mankind are the smallest. Of the lower races of creatures, the changes are so great as often entirely to disguise the natural animal, and to distort, or to disfigure, its shape. But the chief differences in man are rather taken from the tincture of his skin than the variety of his figure: and in all climates he preserves his erect deportment, and the marked superiority of his form. If we look round the world, there seem to be not above six[1] distinct varieties in the human species, each of which is strongly marked, and speaks the kind seldom to have mixed with any other. But there is nothing in the shape, nothing in the faculties, that shows their coming from different originals; and the varieties of climate, of nourishment, and custom, are sufficient to produce every change.

The first distinct race of men is found round the polar regions. The Laplanders, the Esquimaux Indians, the Samœid Tartars, the inhabitants of Nova Zembla, the Borandians, the Greenlanders, and the natives of Kamtschatka, may be considered as one peculiar race of people, all greatly resembling each other in their stature, their complexion, their customs, and their ignorance. These nations being under a rigorous climate, where the productions of nature are but few, and the provisions coarse and unwholesome, their bodies have shrunk to the nature of their food; and their complexions have suffered, from cold, almost a similar change to what heat is known to produce; their colour being a deep brown, in some places inclining to actual blackness. These, therefore, in general, are found to be a race of short stature and odd shape, with countenances as savage as their manners are barbarous. The visage in these countries is large and broad, the nose flat and short, the eyes of a yellowish brown, inclining to blackness, the eyelids drawn towards the temples, the cheek-bones extremely high, the mouth very large, the lips thick and turned outwards, the voice thin and squeaking, the head large, the hair black and straight, the colour of the skin of a dark grayish.[2] They are short in stature, the generality not being above four feet high, and the tallest not above five. Among all these nations the women are as deformed as the men, and resemble them so nearly, that one cannot at first distinguish the sexes from them.

These nations not only resemble each other in their deformity, their dwarfishness, the colour of their hair and eyes, but they have, in a great measure, the same inclinations, and the same manners, being all equally rude, superstitious, and stupid. The Danish Laplanders have a large black cat, to which they communicate their secrets, and consult in all their affairs. Among the Swedish Laplanders there is in every family a drum for consulting the devil; and although these nations are robust and nimble, yet they are so cowardly that they never can be brought into the field. Gustavus Adolphus attempted to form a regiment of Laplanders, but he found it impossible to accomplish his design; for it should seem that they can live only in their own country, and in their own manner. They make use of skates, which are made of fir, of near three feet long, and half-a-foot broad; these are pointed, and raised before, and tied to the foot by straps of leather. With these they skate on the icy snow, and with such velocity, that they very easily overtake the swiftest animals. They make use also of a pole, pointed with iron at one end, and rounded at the other. This pole serves to push them along, to direct their course, to support them from falling, to stop the impetuosity of their motion, and to kill that game which they have overtaken. Upon these skates they descend the steepest mountains, and scale the most craggy precipices; and in these exercises the women are not less skilful than the men. They have all the use of the bow and arrow, which seems to be a contrivance common to all barbarous nations; and which, however, at first, required no small skill to invent. They launch a javelin, also, with great force, and some say, that they can hit a mark no larger than a crown, at thirty yards' distance, and with such force as would pierce a man through. They are all hunters; and particularly pursue the ermine, the fox, the ounce, and the martin, for the sake of their skins. These they barter with their southern neighbours for brandy and tobacco; both which they are fond of to excess. Their food is principally dried fish, the flesh of rein-deer and bears. Their bread is composed of the bones of fishes, pounded and mixed with the inside tender bark of the pine-tree. Their drink is train-oil or brandy; and when deprived of these, water, in which juniper berries have been infused. With regard to their morals, they have all the virtues of simplicity, and all the vices of ignorance. They offer their wives and daughters to strangers, and seem to think it a particular honour if their offer be accepted. They have no idea of religion, or a Supreme Being; the greatest number of them are idolaters; and their superstition is as profound as their worship is contemptible. Wretched and ignorant as they are, yet they do not want pride; they set themselves far above the rest of mankind; and Crantz assures us, that when the Greenlanders are got together, nothing is so customary among them as to turn the Europeans into ridicule. They are obliged, indeed, to yield them the pre-eminence in understanding and mechanic arts; but they do not know how to set any value upon these. They therefore count themselves the only civilized and wellbred people in the world; and it is common with them, when they see a quiet or a modest stranger, to say that he is almost as wellbred as a Greenlander.

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[1] I have taken four of these varieties from Linnæus; those of the Laplanders and Tartars from Mr. Buffon.

[2] Crantz.

From this description, therefore, this whole race of people may be considered as distinct from any other.—Their long continuance in a climate the most inhospitable, their being obliged to subsist on food the most coarse and ill-prepared, the savageness of their manners, and their laborious lives, all have contributed to shorten their stature, and to deform their bodies.[3] In proportion as we approach towards the north pole, the size of the natives appears to diminish, growing less and less as we advance higher, till we come to those latitudes that are destitute of all inhabitants whatsoever.

The wretched natives of these climates seem fitted by nature to endure the rigours of their situation. As their food is but scanty and precarious, their patience in hunger is amazing.[4] A man who has eaten nothing for four days can manage his little canoe in the most furious waves, and calmly subsist in the midst of a tempest that would quickly dash an European boat to pieces. Their strength is not less amazing than their patience: a woman among them will carry a piece of timber or a stone, near double the weight of what an European can lift. Their bodies are of a dark gray all over; and their faces brown or olive. The tincture of their skins partly seems to arise from their dirty manner of living, being generally daubed with train-oil; and partly from the rigours of the climate, as the sudden alterations of cold and raw air in winter, and of burning heats in summer, shade their complexions by degrees, till, in a succession of generations, they become almost black. As the countries in which these reside are the most barren, so the natives seem the most barbarous of any part of the earth. Their more southern neighbours of America treat them with the same scorn that a polished nation would treat a savage one; and we may readily judge of the rudeness of those manners, which even a native of Canada can think more barbarous than his own.

But the gradations of nature are imperceptible; and, while the north is peopled with such miserable inhabitants, there are here and there to be found, upon the edges of these regions, people of a larger stature, and completer figure. A whole race of the dwarfish breed is often found to come down from the north, and settle more to the southward; and, on the contrary, it sometimes happens that southern nations are seen higher up, in the midst of these diminutive tribes, where they have continued for time immemorial. Thus the Ostiac Tartars seem to be a race that have travelled down from the north, and to be originally sprung from the minute savages we have been describing. There are also Norwegians and Finlanders, of proper stature, who are seen to inhabit in latitudes higher even than Lapland. These, however, are but accidental migrations, and serve as shades to unite the distinct varieties of mankind.

The second great variety in the human species seems to be that of the Tartar race; from whence probably the little men we have been describing originally proceeded. The Tartar country, taken in general, comprehends the greatest part of Asia; and is, consequently, a general name given to a number of nations, of various forms and complexions. But, however they seem to differ from each other, they all agree in being very unlike the people of any other country. All these nations have the upper part of the visage very broad, and wrinkled even while yet in their youth. Their noses are short and flat, their eyes little, and sunk in their heads; and, in some of them, they are seen five or six inches asunder. Their cheek-bones are high, the lower part of their visage narrow, the chin long and advanced forward, their teeth of an enormous size, and growing separate from each other; their eyebrows thick, large, and covering their eyes; their eyelids thick, the face broad and flat, the complexion olive-coloured, and the hair black. They are of a middle size, extremely strong, and very robust. They have but little beard, which grows stragglingly on the chin. They have large thighs, and short legs. The ugliest of all are the Calmucks, in whose appearance there seems to be something frightful. They all lead an erratic life, remaining under tents of hair or skins. They live upon horse-flesh and that of camels, either raw or a little sodden between the horse and the saddle. They eat also fish dried in the sun

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[3] Ellis's Voyage, p. 256. [4] Crantz, p. 134, vol. i.

Their most usual drink is mares' milk fermented with millet ground into meal. They all have the head shaven, except a lock of hair on the top, which they let grow sufficiently long to form into tresses on each side of the face. The women, who are as ugly as the men, wear their hair, which they bind up with bits of copper and other ornaments of a like nature. The majority of these nations have no religion, no settled notions of morality, no decency of behaviour. They are chiefly robbers: and the natives of Dagestan, who live near their more polished neighbours, make a traffic of Tartar slaves who have been stolen, and sell them to the Turks and the Persians. Their chief riches consist in horses, of which perhaps there are more in Tartary than in any other part of the world. The natives are taught by custom to live in the same place with their horses; they are continually employed in managing them, and at last bring them to such great obedience, that the horse seems actually to understand the rider's intention.

To this race of men, also, we must refer the Chinese and the Japanese, however different they seem in their manners and ceremonies. It is the form of the body that we are now principally considering; and there is, between these countries, a surprising resemblance. It is in general allowed that the Chinese have broad faces, small eyes, flat noses, and scarce any beard; that they are broad and square-shouldered, and rather less in stature than Europeans. These are marks common to them and the Tartars, and they may, therefore, be considered as being derived from the same original. "I have observed," says Chardin, "that in all people from the east and the north of the Caspian sea, to the peninsula of Malacca, that the lines of the face, and the formation of the visage, are the same. This has induced me to believe, that all these nations are derived from the same original, however different either their complexion or their manners may appear; for as to the complexion, that proceeds entirely from the climate and the food; and as to the manners, these are generally the result of their different degrees of wealth or power." That they come from one stock, is evident also from this, that the Tartars who settle in China quickly resemble the Chinese; and, on the contrary, the Chinese who settle in Tartary soon assume the figure and the manners of the Tartars.

The Japanese so much resemble the Chinese, that one cannot hesitate to rank them in the same class. They only differ in being rather browner, as they inhabit a more southern climate. They are, in general, described as of a brown complexion, a short stature, a broad flat face, a very little beard, and black hair. Their customs and ceremonies are nearly the same; their ideas of beauty similar; and their artificial deformities of blackening the teeth, and bandaging the feet, entirely alike in both countries. They both, therefore, proceed from the same stock; and although they differ very much from their brutal progenitors, yet they owe their civilization wholly to the mildness of the climate in which they reside, and to the peculiar fertility of their soil. To this tribe, also, we may refer the Cochin Chinese, the Siamese, the Tonquinese, and the inhabitants of Arracan, Laos, and Pegu, who, though all differing from the Chinese and each other, nevertheless have too strong a resemblance not to betray their common original.

Another, which makes the third variety in the human species, is that of the southern Asiatics; the form of whose features and persons may be easily distinguished from those of the Tartar races. The nations that inhabit the peninsula of India seem to be the principal stock from whence the inhabitants of the islands that lie scattered in the Indian ocean have been peopled. They are, in general, of a slender shape, with long straight black hair, and often with Roman noses. Thus they resemble the Europeans in stature and features; but greatly differ in colour and habit of body. The Indians are of an olive colour, and, in the more southern parts, quite black; although the word Mogul, in their language, signifies a white man. The women are extremely delicate, and bathe very often; they are of an olive colour, as well as the men: their legs and thighs are long, and their bodies short, which is the opposite to what is seen among the women of Europe. They are, as I am assured, by no means so fruitful as the European women; but they feel the pains of childbirth with much less sensibility, and are generally up and well the day following. In fact, these pains seem greatest in all countries where the women are the most delicate, or the constitution enfeebled by luxury or indolence. The women of savage nations seem, in a great measure, exempt from painful labours; and even the hard-working wives of the peasants among ourselves, have this advantage from a life of industry, that their child-bearing is less painful. Over all India, the children arrive sooner at maturity, than with us of Europe. They often marry and consummate, the husband at ten years old, and the wife at eight; and they frequently have children at that age. However, the women who are mothers so soon, cease bearing before they are arrived at thirty; and at that time they appear wrinkled, and seem marked with all the deformities of age. The Indians have long been remarkable for their cowardice and effeminacy; every conqueror that has attempted the invasion of their country, having succeeded. The warmth of the climate entirely influences their manners; they are slothful, submissive, and luxurious; satisfied with sensual happiness alone, they find no pleasure in thinking; and contented with slavery, they are ready to obey any master. Many tribes among them eat nothing that has life; they are fearful of killing the meanest insect; and have even erected hospitals for the maintenance of all kinds of vermin. The Asiatic

ess is a loose flowing garment, rather fitted for
e purposes of peace and indolence, than of in-
istry or war. The vigour of the Asiatics is, in
neral, conformable to their dress and nourish-
ent; fed upon rice, and clothed in effeminate
lk vestments, their soldiers are unable to oppose
e onset of an European army; and from the
mes of Alexander to the present day, we have
arcely any instances of their success in arms.
pon the whole, therefore, they may be consi-
red as a feeble race of sensualists, too dull to
d rapture in any pleasures, and too indolent
turn their gravity into wisdom. To this class
e may refer the Persians and Arabians, and, in
neral, the inhabitants of the islands that lie
attered in the Indian ocean.

The fourth striking variety in the human spe-
es, is to be found among the negroes of Africa.[5]
is gloomy race of mankind is found to blacken
l the southern parts of Africa, from eighteen
grees north of the line, to its extreme termina-
on at the Cape of Good Hope. I know it is
id, that the Caffres, who inhabit the southern
tremity of that large continent, are not to be
nked among the negro race: however, the dif-
rence between them, in point of colour and
atures, is so small, that they may very easily
grouped in this general picture; and in the
e or two that I have seen, I could not perceive
e smallest difference. Each of the negro na-
ons, it must be owned, differ from each other;
ey have their peculiar countries for beauty,
e us; and different nations, as in Europe,
ide themselves upon the regularity of their
atures. Those of Guinea, for instance, are ex-
emely ugly, and have an insupportable scent;
ose of Mosambique are reckoned beautiful, and
ve no ill smell whatsoever. The negroes, in
neral, are of a black colour, with a smooth soft
in. This smoothness proceeds from the downy
ftness of the hair which grows upon it; the
rength of which gives a roughness to the feel,
those of a white complexion. Their skins,
erefore, have a velvet smoothness, and seem
s braced upon the muscles than ours. The
ir of their heads differs entirely from what we
e accustomed to, being soft, woolly, and short.
he beard also partakes of the same qualities;
t in this it differs, that it soon turns gray,
hich the hair is seldom found to do; so that several are seen with white beards, and black hair, at the same time. Their eyes are generally of a deep hazel; their noses flat and short; their lips thick and tumid; and their teeth of an ivory whiteness. This their only beauty, however, is set off by the colour of their skin; the contrast between the black and white being the more observable. It is false to say that their features are deformed by art; since, in the negro children born in European countries, the same deformities are seen to prevail; the same flatness in the nose; and the same prominence in the lips. They are in general said to be well-shaped; but of such as I have seen, I never found one that might be justly called so; their legs being mostly ill formed, and commonly bending outward on the shinbone. But it is not only in those parts of their bodies that are obvious, they are disproportioned; those parts which among us are usually concealed by dress, with them are large and languid.[6] The women's breasts, after bearing one child, hang down below the navel; and it is customary with them to suckle the child at their backs, by throwing the breast over the shoulder. As their persons are thus naturally deformed, at least to our imaginations, their minds are equally incapable of strong exertions. The climate seems to relax their mental powers still more than those of the body; they are, therefore, in general, found to be stupid, indolent, and mischievous. The Arabians themselves, many colonies of whom have migrated southward into the most inland parts of Africa, seem to have degenerated from their ancestors; forgetting their ancient learning, and losing their beauty, they have become a race scarcely any way distinguishable from the original natives. Nor does it seem to have fared otherwise with the Portuguese, who, about two centuries ago, settled along this coast. They also are become almost as black as the negroes, and are said by some to be even more barbarous.

The inhabitants of America make a fifth race, as different from all the rest in colour, as they are distinct in habitation.[7] The natives of America

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[5] In taking a glance at the population of the im-
ense peninsula of Africa, the attention seems first
turally directed to what was once a most magni-
ent and important, though small, portion of it.
he local situation of ancient Egypt, that great cradle
European civilization and learning, has, probably,
duced the opinion, which has been very prevalent,
at the Egyptians were themselves negroes, or from
negro race. Physiology has, however, detected
is error; for it is clear, from the examination and
mparison of a great many skulls of Egyptian mum-
ies, that these people belonged to the Caucasian
vision, and that their cranium and brain were very
luminous when compared with the existing African
ces.—Ed.

[6] Linnæus, in prima linea sua, fœminas Africanas depingit sicut aliquid deforme in parte genitali gestantes, quod sinum pudoris nuncupat. Attamen nihil differunt a nostratibus in hac parte nisi quod labia pudendæ sint aliquantulum tumidiora. In hominibus etiam penis est longior et multo laxior.

[7] The American variety appears to form a link between the Caucasian and Mongolian, but approximating more to the latter. The skin is dark, with more or less of a copper tint. The hair is straight and black, the beard small, the forehead low, eyes dark and oblique, face broad and prominent, and cheeks rounded. The features in general, particularly the nose, are more distinct and projecting than in the Mongolian type. The mouth is large, and the lips are rather thick. Among the Americans, however, are found many deviations of colour and stature from this general character, though but few of structure and features. The people of Nootka sound are nearly as light as Europeans, but of a dull paleness; so are some of the Peruvians. Birkbeck observes that the natives of the western territory of the United

(except in the northern extremity, where they resemble the Laplanders) are of a red or copper colour: and although, in the old world, different climates produce a variety of complexions and customs, the natives of the new continent seem to resemble each other in almost every respect. They are all nearly of one colour; all have black thick straight hair, and thin black beards; which, however, they take care to pluck out by the roots. They have, in general, flat noses, with high cheek-bones, and small eyes; and these deformities of nature they endeavour to increase by art: they flatten the nose, and often the whole head of their children, while the bones are yet susceptible of every impression. They paint the body and face of various colours, and consider the hair upon any part of it, except the head, as a deformity which they are careful to eradicate. Their limbs are generally slighter made than those of the Europeans; and, I am assured, they are far from being so strong. All these savages seem to be cowardly; they seldom are known to face their enemies in the field, but fall upon them at an advantage; and the greatness of their fears serves to increase the rigours of their cruelty. The wants which they often sustain, make them surprisingly patient in adversity: distress, by being grown familiar, becomes less terrible; so that their patience is less the result of fortitude than of custom. They have all a serious air, although they seldom think; and, however cruel to their enemies, are kind and just to each other. In short, the customs of savage nations in every country are almost the same; a wild, independent, and precarious life, produces a peculiar train of virtues and vices: and patience and hospitality, indolence and rapacity, content and sincerity, are found not less among the natives of America, than all the barbarous nations of the globe.

The sixth and last variety of the human species, is that of the Europeans and the nations bordering on them. In this class we may reckon the Georgians, Circassians, and Mingrelians, the inhabitants of Asia Minor, and the northern parts of Africa, together with a part of those countries which lie north-west of the Caspian sea. The inhabitants of these countries differ a good deal from each other; but they generally agree in the colour of their bodies, the beauty of their complexions, the largeness of their limbs, and the vigour of their understandings. Those arts which might have had their invention among the other races of mankind, have come to perfection there. In barbarous countries the inhabitants go either naked, or are awkwardly clothed in furs or feathers; in countries semi-barbarous, the robes are loose and flowing; but here the clothing is less made for show than expedition, and unites, as much as possible, the extremes of ornament and despatch.

To one or other of these classes we may refer the people of every country: and as each nation has been less visited by strangers, or has had less commerce with the rest of mankind, we find their persons and their manners more strongly impressed with one or other of the characters mentioned above. On the contrary, in those places where trade has long flourished, or where enemies have made many incursions, the races are usually found blended, and properly fall beneath no one character. Thus, in the islands of the Indian ocean, where trade has been carried on for time immemorial, the inhabitants appear to be a mixture of all the nations upon the earth; white, olive, brown, and black men, are all seen living together in the same city, and propagating a mixed breed, that can be referred to none of the classes into which naturalists have thought proper to divide mankind.[8]

Of all the colours by which mankind is diversified, it is easy to perceive, that ours is not only the most beautiful to the eye, but the most advantageous. The fair complexion seems, if I may so express it, as a transparent covering to the soul; all the variations of the passions, every expression of joy or sorrow, flows to the cheek, and, without language, marks the mind. In the slightest change of health also the colour of the European face is the most exact index, and often teaches us to prevent those disorders that we do not as yet perceive; not but that the African black, and the Asiatic olive complexions, admit of their alterations also; but these are neither so distinct, nor so visible, as with us; and in some

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States are various in complexion, some dark, some lighter, but he met with no examples of the copper colour among them. The Chilians are of a reddish brown, but clear; and a tribe of the province of Barva are red and white like ourselves. The depressed forehead is a more general characteristic of all the American tribes; some of them, it is true, increase by art this natural peculiarity; but the character is prevalent among those who use no art to exaggerate it. A depressed forehead is always considered beautiful among them: the Aztec gods and heroes were thus represented by the Mexicans, who used no artificial means to flatten the cranium. There is strong reason to believe, especially from the approximation of the two continents, that the American race originates from the north-eastern Asiatics; traces of resemblance in language, strong and physical similarity, and local facilities of emigration, give countenance to this opinion. There seems no just reason for separating the Esquimaux from the American variety, and classing them more particularly under the Mongolian; at least, no reason that would not justify a similar classification of the nations of the whole American continent. They resemble the Americans in general characteristic traits; and, in Terra del Fuego, and on the Mosquito shore, we find people exactly like them. With the physical characters of this arctic race, the late voyages to the Pole have made us tolerably acquainted. They have high cheek-bones, broad foreheads, and small eyes far apart. Their complexion is a dusky yellow, and some individuals are lighter than others, and exhibit some symptoms of red in the cheeks. Their stature is short, the average height of the males not being more than five feet five or six inches. The women are still less.—Ed.

[8] See Supplementary Note A, p. 239.

countries the colour of the visage is never found to change; but the face continues in the same settled shade in shame and in sickness, in anger and despair.

The colour, therefore, most natural to man, ought to be that which is most becoming; and it is found, that, in all regions, the children are born fair, or at least red, and that they grow more black, or tawny, as they advance in age. It should seem, consequently, that man is naturally white; since the same causes that darken the complexion in infants, may have originally operated, in slower degrees, in blackening whole nations. We could, therefore, readily account for the blackness of different nations, did we not see the Americans, who live under the line, as well as the natives of Negroland, of a red colour, and but a very small shade darker than the natives of the northern latitudes, in the same continent. For this reason, some have sought for other causes of blackness than the climate; and have endeavoured to prove that the blacks are a race of people bred from one man, who was marked with accidental blackness. This, however, is but mere ungrounded conjecture: and, although the Americans are not so dark as the negroes, yet we must still continue in the ancient opinion, that the deepness of the colour proceeds from the excessive heat of the climate. For if we compare the heats of Africa with those of America, we shall find they bear no proportion to each other. In America, all that part of the continent, which lies under the line, is cool and pleasant, either shaded by mountains, or refreshed by breezes from the sea. But in Africa, the wide tract of country that lies under the line is very extensive, and the soil sandy; the reflection of the sun, therefore, from so large a surface of earth, is almost intolerable; and it is not to be wondered at, that the inhabitants should bear, in their looks, the marks of the inhospitable climate. In America the country is but thinly inhabited; and the more torrid tracts are generally left desert by the inhabitants; for which reason they are not so deeply tinged by the beams of the sun. But in Africa the whole face of the country is fully peopled; and the natives are obliged to endure their situation, without a power of migration. It is there, consequently, that they are in a manner tied down to feel all the severity of the heat; and their complexions take the darkest hue they are capable of receiving. We need not, therefore, have recourse to any imaginary propagation, from persons accidentally black, since the climate is a cause obvious and sufficient to produce the effect.

In fact, if we examine the complexion of different countries, we shall find them darken in proportion to the heat of their climate; and the shades gradually to deepen as they approach the line. Some nations, indeed, may be found not so much tinged by the sun as others, although they lie nearer the line. But this ever proceeds from some accidental causes; either from the country lying higher, and consequently being colder; or from the natives bathing oftener, and leading a more civilized life. In general, it may be asserted, that as we approach the line, we find the inhabitants of each country grow browner, until the colour deepens into perfect blackness. Thus, taking our standard from the whitest race of people, and beginning with our own country, which, I believe, bids fairest for the pre-eminence, we shall find the French, who are more southern, a slight shade deeper than we; going farther down, the Spaniards are browner than the French; the inhabitants of Fez darker than they; and the natives of Negroland the darkest of all. In what manner the sun produces this effect, and how the same luminary which whitens wax and linen, should darken the human complexion, is not easy to conceive. Sir Thomas Brown first supposed, that a mucous substance, which had something of a vitriolic quality, settled under the reticular membrane, and grew darker with heat. Others have supposed that the blackness lay in the epidermis, or scarf-skin, which was burnt up like leather. But nothing has been satisfactorily discovered upon the subject; it is sufficient that we are assured of the fact; and that we have no doubt of the sun's tinging the complexion in proportion to its vicinity.[9]

But we are not to suppose that the sun is the only cause of darkening the skin; the wind, extreme cold, hard labour, or coarse and sparing nourishment, are all found to contribute to this effect. We find the peasants of every country, who are most exposed to the weather, a shade darker than the higher ranks of people. The savage inhabitants of all places are exposed still more, and therefore contract a still deeper hue; and this will account for the tawny colour of the North American Indians. Although they live in a climate the same, or even more northerly than ours, yet they are found to be of complexions very different from those of Europe. But it must be considered, that they live continually exposed to the sun; that they use many methods to darken their skins by art, painting them with red ochre, and anointing them with the fat of bears. Had they taken for a succession of several generations, the same precautions to brighten their colour that an European does, it is very probable that they would in time come to have similar complexions, and perhaps, dispute the prize of beauty.

The extremity of cold is not less productive of a tawny complexion than that of heat. The natives of the arctic circle, as was observed, are all brown; and those that lie most to the north are almost entirely black. In this manner both extremes are unfavourable to the human form and colour, and the same effects are produced under the poles that are found at the line.

With regard to the stature of different countries, that seems chiefly to result from the nature of the food, and the quantity of the supply. Not but that the severity of heat or cold may, in some measure, diminish the growth, and produce a dwarfishness of make. But, in general, the food is the great agent in producing this effect; where that is supplied in large quantities, and where its quality is wholesome and nutrimental, the inhabitants are generally seen above the ordinary stature. On the contrary, where it is afforded in a sparing quantity, or very coarse, and void of nourishment in its kind, the inhabitants degenerate, and sink below the ordinary size of mankind. In this respect they resemble other animals, whose bodies, by proper feeding, may be greatly augmented. An ox, on the fertile plains of India, grows to a size four times as large as the diminutive animal of the same kind bred in the Alps. The horses bred in the plains are larger than those of the mountain. So it is with man; the inhabitants of the valley are usually found taller than those of the hill: the natives of the Highlands of Scotland, for instance, are short, broad, and hardy; those of the Lowlands are tall and shapely. The inhabitants of Greenland, who live upon dried fish and seals, are less than those of Gambia or Senegal, where nature supplies them with vegetable and animal abundance.[10]

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[9] See Supplementary Note B, p. 240.

The form of the face seems rather to be the result of custom. Nations who have long considered some artificial deformity as beautiful, who have industriously lessened the feet or flattened the nose, by degrees begin to receive the impression they are taught to assume; and Nature, in a course of ages, shapes itself to the constraint, and assumes hereditary deformity. We find nothing more common in births, than for children to inherit sometimes even the accidental deformities of their parents. We have many instances of squinting in the father, which he received from fright or habit, communicated to the offspring; and I myself have seen a child distinctly marked with a scar, similar to one the father had received in battle. In this manner accidental deformities may become natural ones; and by assiduity may be continued, and even increased, through successive generations. From this, therefore, may have arisen the small eyes and long ears of the Tartar and Chinese nations. From hence originally may have come the flat noses of the blacks, and the flat heads of the American Indians.[11]

In this slight survey, therefore, I think we may see that all the variations in the human figure, as far as they differ from our own, are produced either by the rigour of the climate, the bad quality or the scantiness of the provisions, or by the savage customs of the country. They are actual marks of the degeneracy in the human form; and we may consider the European figure and colour as standards to which to refer all other varieties, and with which to compare them. In proportion as the Tartar or American approaches nearer to European beauty, we consider the race as less degenerated; in proportion as he differs more widely, he has made greater deviation from his original form.

That we have all sprung from one common parent, we are taught both by reason and religion to believe; and we have good reason also to think that the Europeans resemble him more than any of the rest of his children. However, it must not be concealed that the olive-coloured Asiatic, and even the jet-black negro, claim this honour of hereditary resemblance; and assert that white men are mere deviations from original perfection. Odd as this opinion may seem, they have Linnæus, the celebrated naturalist, on their side; who supposes man a native of the tropical climates, and only a sojourner more to the north. But not to enter into a controversy upon a matter of very remote speculation, I think one argument alone will suffice to prove the contrary, and show that the white man is the original source from whence the other varieties have sprung. We have frequently seen white children produced from black parents, but have never seen a black offspring the production of two whites. From hence we may conclude, that whiteness is the colour to which mankind naturally tends: for, as in the tulip, the parent stock is known by all the artificial varieties breaking into it; so in man, that colour must be original which never alters, and to which all the rest are accidentally seen to change.

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[10] In Europe the human stature varies from 4½ to 6 feet. Individuals of six feet, and some inches, are not uncommon. In the Caucasian variety there are no strongly marked national deviations from the ordinary stature. In some parts of Switzerland and Sweden, the natives are rather distinguished for height. The Latin writers have remarked the stature of the ancient Germans; it is probable that they did not exceed the modern Germans in this particular. The Americans exhibit greater varieties in stature than the Europeans. The Peruvians are generally low, but well-proportioned. The people of Terra del Fuego are small and ugly; so are the tribes of Nookta-sound. The Chaymas of South America are short, while the Payaguas, the Guayquilits, and the Caribbees are almost gigantic. Many of the Canadian tribes are very tall. The accounts of travellers respecting the Patagonians have been various and contradictory; from a careful comparison of statements, we conclude the average height of this nation to be from 5 feet 10 inches, to 6½ feet. Similar differences occur in the Ethiopian variety. The negroes generally correspond in stature with Europeans; the Hottentots are usually smaller than other Africans, and the Bushmen are remarkably short. The Kaffers are distinguished for their stature, and the muscularity and symmetry of their figures. The Mongolians are generally shorter in stature than ourselves; but considerable varieties are found among them. The Chinese and Japanese are about our own size. The Calmucks, Burats, &c. are shorter. The people of Loo Choo are a diminutive race; 5 feet 2 inches, being the limit of their average height. The Laplanders, Samoiedes, Greenlanders, and Esquimaux are all short.—Ed.

[11] See Supplementary Note C, p. 242.

I have seen in London, at different times, two white negroes, the issue of black parents, that served to convince me of the truth of this theory. I had before been taught to believe that the whiteness of the negro's skin was a disease, a kind of milky whiteness, that might be called rather a leprous crust than a natural complexion. I was taught to suppose than the numberless white negroes found in various parts of Africa, the white men that go by the name of Chacrelas, in the East Indies, and the white Americans, near the Isthmus of Darien, in the West Indies, were all as so many diseased persons, and even more deformed than the blackest of the natives. But, upon examining that negro which was last shown in London, I found the colour to be exactly like that of an European: the visage white and ruddy, and the lips of the proper redness. However, there were sufficient marks to convince me of its descent. The hair was white and woolly, and very unlike any thing I had seen before. The iris of the eye was yellow, inclining to red; the nose was flat, exactly resembling that of a negro; and the lips thick and prominent. No doubt therefore remained of the child's having been born of negro parents: and the person who showed it had attestations to convince the most incredulous. From this, then, we see that the variations of the negro colour is into whiteness, whereas the white are never found to have a race of negro children. Upon the whole, therefore, all those changes which the African, the Asiatic, or the American, undergo, are but accidental deformities, which a kinder climate, better nourishment, or more civilized manners, would, in a course of centuries, very probably remove.

Note A.—*Varieties of the Human Race.*

"So long as inquiry was limited to extremes of variation in colour, and yielded to the active sensibility of first impressions, we were taught"—says Baron Humboldt, in his work entitled 'Kosmos'—"to consider races, not as differing in degree, but as differing in origin. And the unchangeableness of certain types, amid external causes the most inimical, particularly those of climate, seemed to favour this opinion. But far more forcibly, on the other hand, it appears to me, do the various degrees of colour in the skin, analogous variations in wild and domestic animals, and the information recently obtained upon productive hybrids, attest the unity of the human race. Many contrasts hitherto supposed to exist have disappeared, owing to the researches of Tiedemann upon the brains of Negroes and Europeans, to the anatomical investigations of Brolikk, and those of Weber upon the form of the pelvis. If we take a general view of the dark-coloured African nations over which Prichard's valuable work has shed so much information, and compare these with the races of the South Indian and West Australasian Archipelago, we see at once that dark skins, woolly hair, and negro-like features are not necessarily invariably connected with each other. Geographical inquiries as to the first country, the so-called cradle of the human race, are of a purely mythic character. 'We know,' says William Von Humboldt, in a yet unpublished work, 'no period in which men were not found segregrated in families.' Whether this were originally so or not, we are unable to decide. In countries far distant from each other, some oft-repeated traditions, of very uncertain connexion, support the first view, and infer the origin of all society from the first two created. And the wide extension of this tradition has given it all the credit of being one of the earliest memorials of the history of mankind. Yet, if any thing, it tenders rather negative evidence; it wants strict historical character, and seems to have its origin in that general method of describing an event, of which the conception was uniform, and the probability similarly apparent to the earliest settlers in a land. In fact, all these traditions betray invention; the origin of society ascribed to a period beyond all research, is brought within the range comparatively of one of modern experience; centuries pass over the human race, and then a waste island, or some remote valley, was peopled. Men, in truth, are so fettered to their own race and time, that none willingly admit a generation or a period unconnected with antecedents or the past. Thought and experience alike fail, and inquiry into the origin of language cannot solve the question.

"The membership of mankind is that of species, which we describe by the somewhat indefinite term race. We may accept the old classification of Blumenbach,—the Caucasian, Mongolian, American, and Malayan, or adopt that of Prichard, the Iranic, Turanic, American, Bushman, Negros, Papuas, and Alfouras, but yet no typical exactness, no unvarying natural principle of division in either system can be traced. We set aside what extremes in form and colour equally establish, and races which cannot be included in the above are now called Scythic, and then Allophylic. Iranic is indeed a better term than Caucasian, but geographical nomenclature as the authority for the exode of nations is in general an uncertain guide; for the land which gives the name, for instance Turan, has at various times been inhabited by different tribes—Indo-Germanic and Finnish, but not of Mongolian origin. Language, indeed, when exhibiting a national form, is of great importance either to trace affinity or variation in race. But strict ethnographical study shows that great caution must in this respect be exercised; for conquest, social intercourse, the influence of a new religion, and the blending of races even but to a limited extent, have caused in both continents similar recurring phenomena; so that in languages entirely dissimilar, amid a people of widely different origin, idioms of the same derivatives have been found. And there are other disturbing causes; those, namely, of climate and descent. Whilst, however, we maintain the unity of the human race, we are met by the saddening opinion of a higher and lower order. But this may hardly be. A race more civilized, more susceptible of civilization, more ennobled by intellectual culture, may exist, but no race is originally nobler than another. All are equally destined for freedom, whether in the rude condition of savage life, or through the protection of political institutions. If there be one idea of greater import than another which pervades all history, it is that of humanity and the progress of man. To remove the prejudices which selfish feelings have caused and encouraged between men, to consider them without reference to religion, nation, or colour, but as a great brotherhood destined to the same end,—the free development of intellectual power, is the lesson which all history teaches."

Linnæus (A.D. 1766) was the first systematic writer who ventured to include man as a member of the Animal Kingdom. He established the order Primates, consisting of four genera; 1. Homo, 2. Simia; 3. Lemur; and, 4. Vespertilio. The genus Homo, which he characterized by the brief phrase, "Nosce te ipsum," consisted of the *Homo sapiens* and the *Homo ferus*, the latter founded on a few accidental instances of juvenile outcasts, while the former, subject to variation, *culturâ et loco*, was subdivided into five races; α Americanus; β Europæus; γ Asiaticus; δ Afer; and ε Monstrosus; the last being composed of all the defective individuals observed among the remainder. He avoided the error of those subsequent writers who consider the races of men as so many distinct species. Yet his classification was exceedingly arbitrary, and in attempting to apportion the human race among the four divisions of an antiquated geography, he blended together a number of races, very different in their physical characters, and failed to notice the inhabitants of many extensive regions of the globe which cannot be referred with propriety to any of the principal continents.

Buffon (A. D. 1766), in the excellent treatise, 'Sur les Variétés dans l'espèce Humaine,' with his usual disregard to systematic arrangement, did not propose any natural subdivision of the races. He collected the results scattered over the innumerable voyages and travels of his day, and discriminated with caution among the mass of errors and contradictions with which their writings abounded. Subsequent travellers have added more precise information for correcting and completing the valuable treatise of Buffon, which even now may be read with pleasure and advantage. Already the critical eye of Buffon distinguished the Malay from the other Asiatics, and the Tartars from the Chinese. He admitted the physical differences of the Hyperborean races, distinguished the Hottentots from the other Africans, and acknowledged the unity of the Ethiopians.

Blumenbach (A. D. 1797) admitted five varieties of the human species; 1. Caucasica; 2. Mongolica; 3. Æthiopica; 4. Americana; 5. Malayana. These are little more than the old division of Linnæus, with the substitution of the Malayan variety in place of the H. Monstrosus, Linn. Our chief objection to this arrangement consists in the obvious impropriety of including the Americans and Malays, whose characters are not very decisive, in the same rank with the Caucasians, Mongolians, and Ethiopians. The Malayan division has now become insufficient to contain the numerous and varied races of the Southern Ocean.

Duméril (A.D. 1806) instituted the order Bimanes, which was a most decided improvement upon the order Primates of Linnæus, who placed intellectual Man in the same order with the Apes and Bats. He subdivided the human race into six varieties; 1. La Caucasique, or Arabe-Européenne; 2. L'Hyperboréenne; 3. La Mongole; 4. L'Américaine; 5. La Malaie; 6. L'Ethiopienne or Nègre. His arrangement coincides pretty nearly with that of Blumenbach, with the manifest improvement of separating the Hyperboreans from the Mongolians.

The Baron Cuvier, in the first edition of the 'Régne Animal' (A. D. 1816), admitted only three principal varieties; 1. Blanche ou Caucasique; 2. Jaune ou Mongolique; and, 3. Noir ou Ethiopique; at the same time remarking, that he did not know to which of the above to refer the Malays, Papoos, or Americans.

The Caucasian, to which Europeans belong, is chiefly distinguished by the beautiful form of the head, which approximates to a perfect oval. The skull is large and rounded, and the brow full and elevated. It is also remarkable for variations in the shade of the complexion, and colour of the hair. The skin is generally fair, but susceptible of every tint, and in some nations almost black. The hair is fine, long, and curling.

In the Mongolian variety the physical characters vary considerably; but generally it is recognised by prominent cheek-bones, broad flat visage, narrow and oblique eyes, hair straight and black, scanty beard, olive complexion, and oblique skull, flattened at the sides. This race has formed mighty empires in China and Japan, and occasionally extended its conquests on this side of the Great Desert. It is by no means deficient in intellectual character, but its civilization has long appeared stationary.

The Ethiopian race is distinguished by black or jetty complexion, black woolly hair, compressed cranium, and broad flat nose. A long protruded heel, and a flat shin bone, often distinguish this variety of the human race. The hordes of which this variety is composed are chiefly in a state of complete barbarism.

It is not very easy to refer either the Malays, or the Papuas, to any one of the three grand varieties of mankind already described. It is a question, however, whether the former people can be accurately distinguished from their neighbours on either side; the Caucasian Hindoos on the one, and the Mongolian Chinese on the other. We scarcely find in them characteristics sufficiently striking for this purpose.

The American variety of mankind was originally spread over nearly the whole of North and South America, south of sixtieth degree of north latitude, though their numbers are now thinned, and their possessions curtailed by the incursions of the Caucasians. A reddish-brown complexion, long black lank hair, deficient beard, eyes black and deep-set, receding brow, sometimes from artificial compression, high cheek-bones, prominent aquiline nose, small skull, with the apex high and the back part flat, large mouth and tumid lips, with fine symmetrical frames of middle height, form their chief physical characteristics. Their colour varies much, and also their stature. In their mental character they are generally averse to cultivation, and slow in acquiring knowledge, restless, revengeful, and wholly destitute of maritime adventure. It is undeniable that the American race is tending to extinction.

NOTE B.—*Colour of the skin in different races of men.*

The colouring matter is understood to reside in a membranous network of greater or less density extending over the surface of the body, called the rete mucosum. This is situated between the chorion or true skin and the cuticle. The rete mucosum, or, as it is sometimes called, the cutaneous reticle, consists of a fine texture of vessels, containing fluids of different shades in the black and tawny races. It seems, however, doubtful whether any such membrane for the deposition of colouring fluid exists in white men, though the varieties of fair and dark which we observe among them would seem to require some organization of this kind; nor does this theory sufficiently illustrate the occasional instances of pied or spotted men.

The human skin exhibits various shades of white, yellow, red, brown, and black. There is every possible intermediate shade between the fairest white and the deepest black, but no one gradation of colour is found in all the individuals of any nation. Generally speaking, however, we may refer all the national varieties of colour to the five following classes:—

1. White, accompanied with redness of cheeks. This characterizes all the Europeans except the Laplanders, the Western Asiatics, and the Northern Africans. Considerable variety will be found to exist in the colour generally called white. The Albino possesses a skin of a reddish or a dead white colour, with yellowish white or milk-white hair, and red or very light coloured eyes. The hair over the whole body is unusually soft and white, not of the hoary colour of age, nor the light yellow or flaxen tint of the fair-haired races. It is rather that sort of colour peculiar to a white horse. These peculiarities evidently arise from a deficiency in the colouring principle, which is much the same in the skin, hair, and eyes. The latter organs are in the Albinos pecu-

liarly sensible to the stimulus of light, in consequence of the want of a black pigment, the office of which is to absorb its superfluous portions. Hence we find the eyelids of these people generally closed, and the eyes usually exhibiting some appearances of morbid phenomena. But in twilight, dusk, or even a close approach to darkness, they see remarkably well. This peculiarity exists from birth, never changes, and may be propagated by generation. Some would refer the Albino variety to disease, but this notion appears incorrect, inasmuch as most of the individuals thus characterized are observed to be perfectly strong and healthy. This variety was first observed in the Africans, but it is far from being peculiar to that race. It has, however, never occurred except in detached instances, for though it is observed to be more prevalent in some parts of the world than others, the notion of entire Albino tribes has been exploded. There is another race of men, with a remarkably fair complexion, yellow, flaxen, or red hair, and blue or gray eyes. In these persons the cutaneous capillaries are easily filled, and consequently they exhibit a general sanguineous tint, deeper and more florid in the face. The ancient and modern Germans belong to this variety, and generally the Danes, Dutch, Swedes, English, &c. Lastly, a race very extensive is found with skin of a brownish white, and dark brown or black hair. The Southern Europeans and Western Asiatics are of this character.

2. The second grand variety in human colour is yellow or olive. This characterizes all the Mongolian tribes, and, generally speaking, most of the natives of Upper Asia.

3. Is the red or copper colour, which in various shades is prevalent over the entire American continent, and chiefly confined to it.

4. Brown or tawny. This in lighter or darker variations belongs to the inhabitants of the peninsula of Malacca, and is extended through most of the islands of the Pacific ocean.

5. Black, in an amazing variety of shades, characterizes all the African continent, the northern and southern parts excepted, New Holland, Van Dieman's land, New Guinea, New Hebrides, and some other islands of the South sea. It is mingled with the ordinary colour of the natives in Brazil, California, and India.

It is not to be supposed that these different colours, thus generally described, prevail each of them uniformly in all the individuals of the race; on the contrary, there are considerable gradations, and even tribes have been found among the Americans, and individuals are constantly produced in each respective race with characteristics approaching to those of some other. Children born from an intermixture of different races hold generally a middle station between the two. Thus the Mulatto forms a medium between the African and European. The colour will be more or less dark according to the complexion of the European father or mother. The cheeks are not ruddy, and the hair is black and curled, but less short than the negroes. The iris is always dark.

From the Europeans and Mulattoes proceed what are called Tercerons. These generally resemble Europeans. The hair has nothing of the woolly curl, the skin has a slight brown tint, and the cheeks are red. The offspring of these last and the Europeans are not to be distinguished from our own race. An opposite course will reduce the Mulatto offspring to the characters of the negro, and by intermixture with the latter, the fourth generation will be perfectly black. From the native Indians and the Europeans are born Mestizos. They are much lighter than the Mulattoes, and often not distinguishable in colour from Europeans. The small beard, hands, and feet, and the obliquity of the eyes, mark their Indian blood. The offspring from them and European fathers are in all respects like the Europeans. From Negroes and Americans spring Zambos, resembling Mulattoes, but darker. Among the dark races are sometimes found persons spotted with white.

Under this head of colour, we may briefly notice the varieties in the hair, beard, and iris.

The structure and properties of the hair are closely allied to those of the skin, and it derives the means of its growth, and probably its colouring matter from the cutaneous vessels. Each hair may be traced through the cuticle and surface of the cutis to a bulb partly in the chorion, and partly in the cellular membrane. This bulb consists of a thick outer covering, in which the root of the hair and a vascular pulp by which the root is secreted, are contained. There is a close analogy between the skin and hair. The latter, in the Albino, as before observed, is short and white. A light complexion and thin skin, are usually accompanied with fair or red hair, and darker hair usually belongs to a dark colour and thick skin. In the coloured varieties of the human race, the hair is black and always coarser than that of Europeans. In the spotted negroes the hair growing out of a white patch on the head, is white, a presumptive proof that the colouring matter of the skin and hair is the same. The principal differences in the hair are four. 1. Brownish, deviating into yellow or red, or into black. It is copious, long, and soft, and characterizes the natives of the temperate climates of Europe, and somewhat stronger and darker, and belongs to the Eastern Asiatics and Northern Africans, and the Celtic and Slavonic races in Europe. 2. Black, strong, straight, and thin. This character of hair belongs to the American and Mongolian varieties. 3. A softer black, thick, and curled, is found among the South-sea islanders. 4. Black and crisp, in all the negro tribes. It may be proper to notice here that the hair of the African has been ascertained to bear no resemblance to wool except in appearance, and that it has all the characters of true hair.

The above divisions hold good generally, but we find, as in colour, so in hair, many individual exceptions in the different races. As great differences are observable in the various races in point of beard, as of hair generally. Most individuals of the dark races are remarkably deficient in this particular. The Mongolians have much less beard than the Europeans, and it grows later. The Calmucks have small and poor mustachios, and very little hair on the body. The Burats are nearly beardless, so are the Tungooses and other hordes of Eastern Siberia. The Chinese resemble the Mongolian tribes in this particular; but contrary to their practice the latter encourage the growth of the beard. The custom of exterminating the beard and hair on the body is common among many of the dark nations; but this would not have been attempted and could not be executed if nature had furnished them in this article so plentifully as she has done the Europeans.

There has been much controversy whether the native Americans have beards or not; it is now completely ascertained that they have beards, but weak and imperfect, and that the practice of exterminating them is general. The genuine negroes have very little beard or growth of hair over the body. But the South-sea islanders are by no means deficient in these excrescences.

An analogy similar to that between the hair and skin exists between the latter and the iris of the eye. New-born children in Europe have generally light eyes and hair, and both gradually darken in those of dark complexion. In old persons, as the hair turns gray, the eye loses a portion of its colour. In the Albino there is an entire deficiency of proper colouring matter, so that the iris has a reddish hue from the colour of the blood in the capillaries. The same sympathetic variations in the skin, hair, and eyes are also observable in other animals.

The principal colours of the human eye are blue, passing to grayish in the lighter tints, a sort of obscure orange, a kind of middle tint between blue and orange, sometimes very green in red-haired persons; and lastly, brown, verging to hazel on the one side, and black on the other. To these the reddish eye of the Albino may be added. These varieties occur constantly in individuals of the same race and family. Sometimes they are confined to particular tribes of the same nation. The Gothlanders of Sweden are described with light hair and grayish eyes. The Finlanders with yellow hair and brown eyes, and the Laplanders with both black. Blue eyes with yellow hair have always marked the Germanic tribes. Blue eyes with black or dark hair form a combination not uncommon among the tribes of Koordistan, and others of the Caucasian race, who inhabit elevated situations in Asia. The iris is dark in all the coloured varieties, but in the negro it is so black as to be distinguished with difficulty from the pupil.

NOTE C.—*Characteristic features of the different races of men.*

No two persons are ever met with possessing precisely the same sort of features; yet there are certain generally characteristic countenances belonging to the different races of mankind, and even to particular nations. To enter into all the minute variations would be endless, but they have been reduced by Blumenbach to the five following, which include all the leading traits:

1. An oval countenance, with the features moderately inter-distinguished; high and broad forehead; nose aquiline, or slightly convex or prominent; cheek-bones not prominent; small mouth and lips slightly curved; chin full and well rounded. This face is most consonant with our ideas of beauty, and is characteristic in greater or less degrees of perfection of the Caucasian tribes.
2. Broad and flattish face; parts ill-distinguished from each other; space between the eyes flat and broad; flat nose; projecting cheeks; narrow and oblique eyelids, and chin rather prominent. This is the Mongolian face.
3. Broad, but not flat visage; prominent cheek-bones; short forehead; eyes deeply fixed; nose flattish, but prominent. Such is the American face.
4. Narrow face, projecting below; narrow, retreating, and arched forehead; prominent eyes; thick nose and lips, &c. Negro face.
5. Face not so narrow as the last, rather projecting downwards; bottled nose, and large mouth. Malay countenance.

Placing these variations of the human countenance thus beside each other, the difference appears very striking. But we must repeat of the characters of countenance above described, as of those of colour, that they are by no means to be found the same in all the individuals of each respective race; on the contrary, individual deviations from the given type are numerous. Among the African and American nations, many persons are found with features as regular and as handsome as any Europeans. The same is more especially true of the South-Sea Islanders. Among ourselves how many have the characteristic features of other races! It may be observed, however, that rather less deviation from the characteristic model is observable in the Mongolian than in the other varieties. Though even there there is considerable difference, if not in form, at least in expression of features. As for example, between the Calmuck and the Chinese.

From the features we naturally proceed to the skull. This, in the Caucasian variety, is more fully developed in the upper and front parts, these forming a large and smooth convexity, a little flattened towards the temples. There is a general softness, harmony, and proportion in the entire contour of the head. Some differences in the formation of the skull have been observed in different nations of the Caucasian race: in the Turks, for instance, a singular globularity of this part has been remarked; and in the Poles and Russians a considerable contraction of the orbits. But we have not sufficient information on this subject to lead us to any definite conclusions.

In the Mongolian variety the head is of a square form, with the forehead low and slanting. The orbits are large and open, and the superciliary arches elevated.

In the Ethiopian variety the front of the head is laterally compressed and considerably elongated, so that the length of the whole skull from the teeth to the occiput is great. It forms a complete contrast to the globular head of some Europeans, and to the square head of the Calmucks. The forehead is wonderfully narrowed off, and the face widened below; the frontal bone is shorter, and it and the parietal less excavated than in the European. The temporal ridge is higher; the compression of the front of the skull arises from the strength of the temporal muscles; the foramen magnum is larger and farther back, and the apertures for the nerves are larger; the bony substance is hard, and the whole weight of the skull more considerable; the organs of sense are more developed, and the narrow forehead and protruded muzzle give to the negro head the appearance of a decidedly animal character.

Some of the South African tribes vary a little from the negro conformation of skull. In the head of a Bushman, given by Blumenbach, the cranium is less compressed, the orbits and cheek-bones are wide, and the jaws not prominent. There are other differences, but we scarcely know sufficient of these tribes to class them under any given variety. The origin of the Hottentots, Caffres, Bushmen, and their subdivisions, found at the extremity of South Africa, is quite unknown. They exhibit characters strongly approximating to, and discrepancies equally deviating from, their negro neighbours.

The American head is thus characterized: broad cheek-bones, depressed forehead, deep orbits, and the nasal cavity generally large.

The Esquimaux and Greenlanders, who seem to form a link between the Americans and Mongolians, have broad cheek-bones, large jaws and face, flattened nose, the cranium sufficiently ample, but distinguished by a posterior elongation.

The Carib tribes are conspicuous for a most remarkable depression of the forehead, which defect, like others of the Americans, they increase by artificial means. The hinder parts of the skull greatly preponderate; the face is large and muscular; the nasal bone neither small nor flat; the cavity is large, and the jaws and teeth exhibit manifestations of great strength.

The general characters in this respect attributed to the Malay variety are, a moderately-narrowed cranium slanting at the interior and upper part; face large, and jaws prominent. But, indeed, the numerous nations comprehended, with not much philosophical precision, under this variety, exhibit very various and opposing characters; some are not distinguishable in the formation of this part from Europeans, some partake of the Mongole, and many of the negro type. In truth, the above division of skulls is somewhat arbitrary, and though sufficient for general purposes, is by no means universally applicable.

Camper was the first anatomist who distinguished and described in an accurate manner the differences of form which have been discovered on comparing the skulls of different races; he invented a technical method by which he imagined he could display in a single measurement the essential difference of skulls as to form and capacity, not only in reference to various nations of men, but likewise to the inferior species of animals; this method he thus describes:—The basis on which the distinction of nations is founded may be displayed by two straight lines, one of which is to be drawn through the meatus auditorius to the base of the nose, and the other touching the prominent centre of the forehead, and falling thence on the most advancing part of the upper jawbone, the head being viewed in profile. In the angle produced by these two lines the distinctions are found to exist in different nations and species of animals. The heads of birds display the smallest angle, and it always becomes of greater extent in proportion as the animal approaches more nearly the human figure. In one species of the ape tribe, the head has a facial angle of 42 degrees; in another of the same family, the facial angle contains 50 degrees; next to this is the head of an African negro, which, as well as the Calmuck, forms an angle of 70 degrees; whilst in the heads of Europeans it contains 80 degrees. On this difference of 10 degrees in the facial angle the superior beauty of the European depends; while the high character of beauty in some ancient works of statuary, as in the head of Apollo and the Medusa of Sisocles, is given by an angle of 100 degrees.

CHAP. XII.

OF MONSTERS.

Hitherto I have only spoken of those varieties in the human species that are common to whole nations; but there are varieties of another kind, which are only found in the individual, and being more rarely seen, are therefore called *monstrous*. If we examine into the varieties of distorted nature, there is scarcely a limb of the body, or a feature in the face, that has not suffered some reprobation, either from art or nature; being enlarged or diminished, lengthened or wrested, from its due proportion. Linnæus, after having given a catalogue of monsters, particularly adds, the flat heads of Canada, the long heads of the Chinese, and the slender waists of the women of Europe, who, by strait lacing, take such pains to destroy their health, through a mistaken desire to improve their beauty.[1] It belongs more to the physician than the naturalist to attend to these minute deformities; and indeed it is a melancholy contemplation to speculate upon a catalogue of calamities, inflicted by unpitying Nature, or brought upon us by our own caprice. Some, however, are fond of such accounts; and there have been books filled with nothing else. To these, therefore, I refer the reader; who may be better pleased with accounts of men with two heads, or without any head, of children joined in the middle, of bones turned into flesh, or flesh converted into bones, than I am.[2] It is sufficient here to observe, that every day's experience must have shown us miserable instances of this kind produced by nature or affectation; calamities that no pity can soften, or assiduity relieve.

Passing over, therefore, every other account, I shall only mention the famous instance quoted by Father Malbranche upon which he founds his beautiful theory of monstrous productions. A woman of Paris, the wife of a tradesman, went to see a criminal broke alive upon the wheel, at the place of public execution. She was at that time two months advanced in her pregnancy, and no way subject to any disorders to affect the child in her womb. She was, however, of a tender habit of body; and, though led by curiosity to this horrid spectacle, very easily moved to pity and compassion. She felt, therefore, all those strong emotions which so terrible a sight must naturally inspire; shuddering at every blow the criminal received, and almost swooned at his cries. Upon returning from this scene of blood, she continued for some days pensive, and her imagination still wrought upon the spectacle she had lately seen. After some time, however, she seemed perfectly recovered from her fright, and had almost forgotten her former uneasiness. When the time of her delivery approached, she seemed no ways mindful of her former terrors, nor were her pains in labour more than usual in such circumstances. But what was the amazement of her friends and assistants when the child came into the world! It was found that every limb in its body was broken like those of the malefactor, and just in the same place. This poor infant that had suffered the pains of life even before its coming into the world, did not die, but lived in an hospital in Paris, for twenty years after, a wretched instance of the supposed powers of imagination in the mother, of altering and distorting the infant in the womb. The manner in which Malbranche reasons upon this fact, is as follows: the Creator has established such a sympathy between the several parts of nature, that we are led not only to imitate each other, but also to partake in the same affections and desires. The animal spirits are thus carried to the respective parts of the body, to perform the same actions which we see others perform, to receive in some measure their wounds, and take part in their sufferings. Experience tells us, that if we look attentively on any person severely beaten, or sorely wounded, the spirits immediately flow into those parts of the body which correspond to those we see in pain. The more delicate the constitution, the more it is thus affected; the spirits making a stronger impression on the fibres of a weakly habit than of a robust one. Strong vigorous men see an execution without much concern, while women of nicer texture are struck with horror and concern. This sensibility in them must, of consequence, be communicated to all parts of their body; and as the fibres of the child in the womb are incomparably finer than those of the mother, the course of the animal spirits must consequently produce greater alterations. Hence every stroke given to the criminal forcibly struck the imagination of the woman; and by a kind of counter-stroke, the delicate tender frame of the child.

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[1] Linnæi Syst. vol. i. p. 29. Monorchides ut minus fertiles.

[2] Vide Phil. Trans. passim. Miscellan. Curioss. Johan. Baptist. Wenck. Dissertatio Physica an ex virilis humani seminis cum brutali per nefarium coitum commixtione, aut vicissim ex bruti maris cum muliebri humano seminis commixtione possit verus homo generari. Vide etiam, Johnstoni Thaumatographia Naturalis. Vide Adalberti Disquisitio Physica ostenti duorum puerorum unus quorum dente aureo, alter cum capite giganteo Biluæ spectabantur. A man without lungs and stomach, Journal de Sçavans, 1682, p. 301; another without any brain, Andreas Caroli Memorabilia, p. 167, an. 1676; another without any head, Giornale di Roma, anno 1675, p. 26; another without any arms, New Memoirs of Literature, vol. iv. p. 446. In short, the variety of these accounts is almost infinite; and perhaps, their use is as much circumscribed as their variety is extensive.

Such is the reasoning of an ingenious man upon a fact, the veracity of which many have since called in question.[3] They have allowed, indeed, that such a child might have been produced, but have denied the cause of its deformity. "How could the imagination of the mother," say they, "produce such dreadful effects upon her child? She has no communication with the infant; she scarcely touches it in any part; quite unaffected with her concerns, it sleeps in security, in a manner secluded by a fluid in which it swims, from her that bears it. With what a variety of deformities," say they, "would all mankind be marked, if all the vain and capricious desires of the mother were thus readily written upon the body of the child?" Yet notwithstanding this plausible way of reasoning, I cannot avoid giving some credit to the variety of instances I have either read or seen upon this subject. If it be a prejudice, it is as old as the days of Aristotle, and to this day as strongly believed by the generality of mankind as ever. It does not admit of a reason; and, indeed, I can give none, even why the child should, in any respect, resemble the father or the mother. The fact we generally find to be so. But why it should take the particular print of the father's features in the womb is as hard to conceive, as why it should be effected by the mother's imagination. We all know what a strong effect the imagination has on those parts in particular, without being able to assign a cause how this effect is produced; and why the imagination may not produce the same effect in marking the child that it does in forming it, I see no reason. Those persons whose employment it is to rear up pigeons of different colours, can breed them, as their expression is, to a feather. In fact, by properly pairing them, they can give what colour they will to any feather, in any part of the body. Were we to reason upon this fact, what could we say? Might it not be asserted, that the egg, being distinct from the body of the female cannot be influenced by it? Might it not be plausibly said, that there is no similitude between any part of the egg and any particular feather which we expect to propagate; and yet for all this the fact is known to be true, and what no speculation can invalidate. In the same manner, a thousand various instances assure us that the child in the womb is sometimes marked by the strong affections of the mother: how this is performed we know not; we only see the effect, without any connection between it and the cause. The best physicians have allowed it; and have been satisfied to submit to the experience of a number of ages; but many disbelieve it, because they expect a reason for every effect. This, however, is very hard to be given, while it is very easy to appear wise by pretending incredulity.

Among the number of monsters, dwarfs and giants are usually reckoned; though not, perhaps, with the strictest propriety, since they are no way different from the rest of mankind, except in stature. It is a dispute, however, about words; and therefore scarcely worth contending about. But there is a dispute, of a more curious nature, on this subject; namely, whether there are races of people thus very diminutive, or vastly large; or whether they be merely accidental varieties, that now and then are seen in a country, in a few persons whose bodies some external cause has contributed to lessen or enlarge.

With regard to men of diminutive stature, all antiquity has been unanimous in asserting their national existence. Homer was the first who has given us an account of the pigmy nation contending with the cranes; and what poetical license might be supposed to exaggerate, Athenæus has attempted seriously to confirm by historical assertion.[4] If we attend to these, we must believe that, in the internal parts of Africa, there are whole nations of pigmy beings, not more than a foot in stature, who continually wage an unequal war with the birds and beasts that inhabit the plains in which they reside. Some of the ancients, however, and Strabo in particular, have supposed all these accounts to be fabulous; and have been more inclined to think this supposed nation of pigmies nothing more than a species of apes, well known to be numerous in that part of the world. With this opinion the moderns have all concurred; and that diminutive race which was described as human, has been long degraded into a class of animals that resemble us but very imperfectly.

The existence, therefore, of a pigmy race of mankind being founded in error, or in fable, we can expect to find men of diminutive stature only by accident, among men of the ordinary size. Of these accidental dwarfs, every country, and almost every village, can produce numerous instances. There was a time when these unfavoured children of Nature were the peculiar favourites of the great; and no prince or nobleman thought himself completely attended unless he had a dwarf among the number of his domestics. These poor little men were kept to be laughed at; or to raise the barbarous pleasure of their masters, by their contrasted inferiority. Even in England, as late as the times of King James I. the court was at one time furnished with a dwarf, a giant, and a jester; these the king often took a pleasure in opposing to each other, and often fomented quarrels among them, in order to be a concealed spectator of their animosity. It was a particular entertainment of the courtiers at that time to see little Jeffrey, for so the dwarf was called, ride round the lists, expecting his antagonist; and discovering in his actions, all the marks of contemptible resolution.

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[3] Buffon, vol. iv, p. 9.

[4] Atherœus, ix. 390.

It was in the same spirit, that Peter of Russia, in the year 1710, celebrated a marriage of dwarfs. This monarch, though raised by his native genius far above a barbarian, was, nevertheless, still many degrees removed from actual refinement. His pleasures, therefore, were of the vulgar kind; and this was among the number. Upon a certain day, which he had ordered to be proclaimed several months before, he invited the whole body of his courtiers, and all the foreign ambassadors, to be present at the marriage of a pigmy man and woman. The preparations for this wedding were not only very grand, but executed in a style of barbarous ridicule. He ordered that all the dwarf men and women, within two hundred miles, should repair to the capital; and also insisted that they should be present at the ceremony. For this purpose he supplied them with proper vehicles; but so contrived it, that one horse was seen carrying in a dozen of them into the city at once, while the mob followed, shouting and laughing, from behind. Some of them were at first unwilling to obey an order which they knew was calculated to turn them into ridicule, and did not come; but he soon obliged them to obey; and, as a punishment, enjoined that they should wait upon the rest at dinner. The whole company of dwarfs amounted to seventy, besides the bride and bridegroom, who were richly adorned, and in the extremity of the fashion. For this little company in miniature, every thing was suitably provided; a low table, small plates, little glasses, and, in short, every thing was so fitted as if all things had been dwindled to their own standard. It was his great pleasure to see their gravity and their pride; the contention of the women for places and the men for superiority. This point he attempted to adjust, by ordering that the most diminutive should take the lead; but this bred disputes, for none would then consent to sit foremost. All this, however, being at last settled, dancing followed the dinner, and the ball was opened with a minuet by the bridegroom, who measured exactly three feet two inches high. In the end, matters were so contrived, that this little company, who met together in gloomy pride, and unwilling to be pleased, being at last familiarized to laughter, joined in the diversion, and became, as the journalist has it,[5] extremely sprightly and entertaining.

But whatever may be the entertainment such guests might afford when united, I never found a dwarf capable of affording any when alone. I have sometimes conversed with some of these that were exhibited at our fairs about Town, and have ever found their intellects as contracted as their persons. They, in general, seemed to me to have faculties very much resembling those of children, and their desires likewise of the same kind; being diverted with the same sports, and best pleased with such companions. Of all those I have seen, which may amount to five or six, the little man, whose name was Coan, that died lately at Chelsea, was the most intelligent and sprightly. I have heard him and the giant, who sung at the theatres, sustain a very ridiculous duet, to which they were taught to give great spirit. But this mirth, and seeming sagacity, were but assumed. He had, by long habit, been taught to look cheerful upon the approach of company; and his conversation was but the mere etiquette of a person that had been used to receive visitors. When driven out of his walk, nothing could be more stupid or ignorant, nothing more dejected or forlorn. But we have a complete history of a dwarf, very accurately related by Mr. Daubenton, in his part of the Histoire Naturelle; which I will here take leave to translate.

This dwarf, whose name was Baby, was well known, having spent the greatest part of his life at Lunenville in the palace of Stanislaus, the titular king of Poland. He was born near the village of Plaisne, in France, in the year 1741. His father and mother were peasants, both of good constitutions, and inured to a life of husbandry and labour. Baby, when born, weighed but a pound and a quarter. We are not informed of the dimensions of his body at that time; but we may conjecture they were very small, as he was presented on a plate to be baptized, and for a long time lay in a slipper. His mouth, although proportioned to the rest of his body, was not, at that time, large enough to take in the nipple; and he was, therefore, obliged to be suckled by a she-goat that was in the house; and that served as a nurse, attending to his cries with a kind of maternal fondness. He began to articulate some words when eighteen months old; and at two years he was able to walk alone. He was then fitted with shoes that were about an inch and a half long. He was attacked with several acute disorders; but the small-pox was the only one which left any marks behind it. Until he was six years old, he eat no other food but pulse, potatoes, and bacon. His father and mother were, from their poverty, incapable of affording him any better nourishment; and his education was little better than his food, being bred up among the rustics of the place. At six years old he was about fifteen inches high; and his whole body weighed but thirteen pounds. Notwithstanding this, he was well-proportioned and handsome; his health was good, but his understanding scarcely passed the bounds of instinct. It was at that time that the king of Poland, having heard of such a curiosity, had him conveyed to Lunenville, gave him the name of *Baby*, and kept him in his palace.

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[5] Die dench wurdige. Iwerg. Hockweit, &c. Lipsæ, 1713, vol. viii. p. 102, seq.

Baby, having thus quitted the hard condition of a peasant, to enjoy all the comforts and conveniences of life, seemed to receive no alteration from his new way of living, either in mind or person. He preserved the goodness of his constitution till about the age of sixteen, but his body seemed to increase very slowly during the whole time; and his stupidity was such, that all instructions were lost in improving his understanding. He could never be brought to have any sense of religion, nor even to show the least signs of a reasoning faculty. They attempted to teach him dancing and music, but in vain; he never could make anything of music; and as for dancing, although he beat time tolerably exact, yet he could never remember the figure, but while his dancing-master stood by to direct his motions. Notwithstanding, a mind thus destitute of understanding was not without its passions; anger and jealousy harassed it at times; nor was he without desires of another nature.

At the age of sixteen, Baby was twenty-nine inches tall; at this he rested; but having thus arrived at his acme, the alterations of puberty, or rather, perhaps, of old age, came fast upon him. From being very beautiful, the poor lit-

human race, is that of its extraordinary magnitude. Concerning the reality of a nation of giants, there have been many disputes among the learned. Some have affirmed the probability of such a race; and others, as warmly have denied the possibility of their existence. But it is not from any speculative reasonings, upon a subject of this kind, that information is to be obtained; it is not from the disputes of the scholar, but the labours of the enterprising, that we are to be instructed in this inquiry. Indeed, nothing can be more absurd, than what some learned men have advanced upon this subject. It is very unlikely, says Grew, that there should either be dwarfs or giants; or if such, they cannot be fitted for the usual enjoyment of life and reason. Had man been born a dwarf, he could not have been a reasonable creature: for to that end he must have a jolt head, and then he would not have body and blood enough to supply his brain with spirits; or if he had a small head, proportionable to his body, there would not be brain enough for conducting life. But it is still worse with giants; and there could never have been a nation of such, for there would not be food enough found in any country to sustain them; or if there were beasts sufficient for this purpose, there would not be grass enough for their maintenance. But what is still more, add others, giants could never be able to support the weight of their own bodies; since a man of ten feet high, must be eight times as heavy as one of the ordinary stature; whereas he has but twice the size of muscles to support such a burden: and, consequently, would be overloaded with the weight of his own body. Such are the theories upon this subject; and they require no other answer, but that experience proves them both to be false: dwarfs are found capable of life and reason; and giants are the clouds, a man of enormous stature, dancing and singing, and putting dust upon his head, as they supposed, in token of peace. This overture for friendship was, by Magellan's command, quickly answered by the rest of his men; and the giant approaching, testified every mark of astonishment and surprise. He was so tall, that the Spaniards only reached his waist; his face was broad, his colour brown, and painted over with a variety of tints; each cheek had the resemblance of a heart drawn upon it; his hair was approaching to whiteness; he was clothed in skins, and armed with a bow. Being treated with kindness, and dismissed with some trifling presents, he soon returned with many more of the same stature; two of whom the mariners decoyed on ship-board: nothing could be more gentle than they were in the beginning; they considered the fetters that were preparing for them as ornaments, and played with them like children with their toys; but when they found for what purpose they were intended, they instantly exerted their amazing strength, and broke them in pieces with a very easy effort. This account, with a variety of other circumstances, has been confirmed by succeeding travellers. Herrara, Sebald Wert, Oliver Van Noort, and James le Maire, all correspond in affirming the fact, although they differ in many particulars of their respective descriptions. The last voyager we have had, that has seen this enormous race, is Commodore Byron. I have talked with the person who first gave the relation of that voyage, and who was the carpenter of the commodore's ship; he was a sensible, understanding man, and I believe extremely faithful. By him, therefore, I was assured, in the most solemn manner, of the truth of his relation; and this account has since been confirmed by one or two publications; in all which the particulars are pretty nearly the same. One of the circumstances which most puzzled me to reconcile to probability was that of the horses, on which they are described as riding down to the shore. We know the American horse to be of the European breed; and, in some measure, to be degenerated from the original. I was at a loss, therefore, to account how a horse of not more than fourteen hands high, was capable of carrying a man of nine feet; or, in other words, an animal almost as large as itself. But the wonder will cease, when we consider, that so small a beast as an ass will carry a man of ordinary size tolerably well; and the proportion between this and the former instance is nearly exact. We can no longer, therefore, refuse our assent to the existence of this gigantic race of mankind: in what manner they are propagated, or under what regulations they live, is a subject that remains for future investigation. It should appear, however, that they are a wandering nation, changing their abode with the course of the sun, and shifting their situation for the convenience of food, climate, or pasture.[6]

This race of giants are described as possessed of great strength; and, no doubt, they must be very different from those accidental giants that are to be seen in different parts of Europe. Stature, with these, seems rather their infirmity than their pride; and adds to their burden, without increasing their strength. Of those I have seen, the generality were ill-formed and unhealthful; weak in their persons, or incapable of exerting what strength they were possessed of. The same defects of understanding that attended those of suppressed stature, were found in those who were thus overgrown: they were heavy, phlegmatic, stupid, and inclined to sadness. Their numbers, however, are but few; and it is thus kindly ordered by Providence, that as the middle stature is the best fitted for happiness, so the middle ranks of mankind are produced in the greatest variety.

However, mankind seems naturally to have a respect for men of extraordinary stature; and it has been a supposition of long standing that our ancestors were much taller, as well as much more beautiful, than we. This has been, indeed, a theme of poetical declamation from the beginning; and man was scarcely formed, when he began to deplore an imaginary decay. Nothing is more natural than this progress of the mind, in looking up to antiquity with reverential wonder. Having been accustomed to compare the wisdom of our fathers with our own, in early imbecility, the impression of their superiority remains when they no longer exist, and when we cease to be inferior. Thus the men of every age consider the past as wiser than the present; and the reverence seems to accumulate as our imaginations ascend. For this reason, we allow remote antiquity many advantages, without disputing their title; the inhabitants of uncivilized countries represent them as taller and stronger; and the people of a more polished nation, as more healthy and more wise. Nevertheless, these attributes seem to be only the prejudices of ingenuous minds; a kind of gratitude, which we hope in turn to receive from posterity. The ordinary stature of men, Mr. Derham observes, is, in all probability, the same now as at the beginning. The oldest measure we have of the human figure, is in the monument of Cheops, in the first pyramid of Egypt. This must have subsisted many hundred years before the times of Homer, who is the first that deplores the decay. This monument, however, scarcely exceeds the measure of our ordinary coffins: the cavity is no more than six feet long, two feet wide, and deep in about the same proportion. Several mummies also, of a very early age, are found to be only of the ordinary stature; and show that, for these three thousand years at least, men have not suffered the least diminution. We have many corroborating proofs of this, in the ancient pieces of armour which are dug up in different parts of Europe. The brass helmet dug up at Medauro fits one of our men, and yet is allowed to have been left there at the overthrow of Asdrubal. Some of our finest antique statues, which we learn from Pliny and others to be exactly as big as the life, still continue to this day, remaining monuments of the superior excellence of their workmen indeed, but not of the superiority of their stature. We may conclude, therefore, that men have been in all ages pretty much of the same size they are at present; and that the only difference must have been accidental, or perhaps national.

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[6] Later voyagers have not confirmed this account, in some particulars.

As to the superior beauty of our ancestors, it is not easy to make the comparison: beauty seems a very uncertain charm; and frequently is less in the object, than in the eye of the beholder. Were a modern lady's face formed exactly like the Venus of Medicis, or the sleeping vestal, she would scarce be considered beautiful, except by the lovers of antiquity, whom, of all her admirers, perhaps, she would be least desirous of pleasing. It is true, that we have some disorders among us that disfigure the features, and from which the ancients were exempt; but it is equally true, that we want some which were common among them, and which were equally deforming. As for their intellectual powers, these also were probably the same as ours: we excel them in the sciences, which may be considered as an history of accumulated experience; and they excel us in the poetic arts, as they had the first rifling of all the striking images of Nature.

CHAP. XIII.

OF MUMMIES, WAX-WORKS, ETC.

"Man[1] is not content with the usual term of life, but he is willing to lengthen out his existence by art; and although he cannot prevent death, he tries to obviate his dissolution. It is natural to attempt to preserve even the most trifling relics of what has long given us pleasure; nor does the mind separate from the body, without a wish, that even the wretched heap of dust it leaves behind may yet be remembered. The embalming practised in various nations, probably had its rise in this fond desire: an urn filled with ashes, among the Romans, served as a pledge of continuing affection; and even the grassy graves in our own churchyards are raised above the surface, with the desire that the body below should not be wholly forgotten. The soul, ardent after eternity for itself, is willing to procure, even for the body, a prolonged duration."

But of all nations, the Egyptians carried this art to the highest perfection: as it was a principle of their religion, to suppose the soul continued only coeval to the duration of the body, they tried every art to extend the life of the one by preventing the dissolution of the other. In this practice they were exercised from the earliest ages; and the mummies they have embalmed in this manner continue in great numbers to the present day. We are told, in Genesis, that Joseph, seeing his father expire, gave orders to his physicians to embalm the body, which they executed in the compass of forty days, the usual time of embalming. Herodotus also, the most ancient of the profane historians, gives us a copious detail of this art, as it was practised, in his time, among the Egyptians. There are certain men among them, says he, who practise embalming as a trade; which they perform with all expedition possible. In the first place, they draw out the brain through the nostrils, with irons adapted to this purpose; and in proportion as they evacuate it in this manner, they fill up the cavity with aromatics: they next cut open the belly near the sides with a sharpened stone, and take out the entrails, which they cleanse, and wash in palm oil; having performed this operation, they roll them in aromatic powder, fill them with myrrh, cassia, and other perfumes, except incense; and replace them, sewing up the body again. After these precautions, they salt the body with nitre, and keep it in the salting place for seventy days, it not being permitted to preserve it so any longer. When the seventy days are accomplished, and the body washed once more, they swathe it in bands made of linen, which have been dipt in a gum the Egyptians use instead of salt. When the friends have taken back the body, they make a hollow trough, something like the shape of a man, in which they place the body; and this they enclose in a box, preserving the whole as a most precious relic, placed against the wall. Such are the ceremonies used with regard to the rich. As for those who are contented with an humbler preparation, they treat them as follows: they fill a syringe with an odoriferous liquor extracted from the cedar-tree, and, without making any incision, inject it up the body of the deceased, and then keep it in nitre, as long as in the former case. When the time is expired, they evacuate the body of the cedar liquor which had been injected; and such is the effect of this operation, that the liquor dissolves the intestines, and brings them away: the nitre also serves to eat away the flesh, and leaves only the skin and the bones remaining. This done, the body is returned to the friends, and the embalmer takes no farther trouble about it. The third method of embalming those of the meanest condition is merely by purg-

[1] This chapter I have, in a great measure, translated from Mr. Daubenton. Whatever is added from others, is marked by inverted commas.

ing and cleansing the intestines by frequent injections, and preserving the body for a similar term in nitre, at the end of which it is restored to the relations.

Diodorus Siculus also makes mention of the manner in which these embalmings are performed. According to him there were several officers appointed for this purpose; the first of them, who was called the scribe, marked those parts of the body on the left side which were to be opened; the cutter made the incision; and one of those that were to salt it drew out all the bowels, except the heart, and the kidneys; another washed them in palm wine and odoriferous liquors: afterwards they anointed for above thirty days with cedar, gum, myrrh, cinnamon, and other perfumes. These aromatics preserved the body entire for a long time, and it gave a very agreeable odour. It was not in the least disfigured by this preparation; after which it was returned to the relations, who kept it in a coffin, placed upright against a wall.

Most of the modern writers who have treated on this subject, have merely repeated what has been said by Herodotus; and if they add anything of their own, it is but merely from conjecture. Dumont observes that it is very probable, that aloes, bitumen, and cinnamon, make a principal part of the composition which is used on this occasion: he adds, that after embalming, the body is put into a coffin, made of the sycamore tree, which is almost incorruptible. Mr. Grew remarks, that in an Egyptian mummy in the possession of the Royal Society, the preparation was so penetrating as to enter into the very substance of the bones, and rendered them so black that they seemed to have been burned. From this he is induced to believe that the Egyptians had a custom of embalming their dead, by boiling them in a kind of liquid preparation, until all the aqueous parts of the body were exhaled away; and until the oily or gummy matter had penetrated throughout. He proposes, in consequence of this, a method of macerating, and afterwards of boiling the dead body in oil of walnut.

I am, for my own part, of opinion, that there were several ways of preserving dead bodies from putrefaction; and that this would be no difficult matter, since different nations have all succeeded in the attempt. We have an example of this kind among the Guanches, the ancient inhabitants of the island of Teneriffe. Those who survived the general destruction of this people by the Spaniards, when they conquered this island, informed them, that the art of embalming was still preserved there; and that there was a tribe of priests among them possessed of the secret, which they kept concealed as a sacred mystery. As the greatest part of the nation was destroyed, the Spaniards could not arrive at a complete knowledge of this art; they only found out a few of the particulars. Having taken out the bowels, they washed the body several times in a lee made of the dried bark of the pine-tree, warmed, during the summer, by the sun, or by a stove in the winter. They afterwards anointed it with butter, or the fat of bears, which they had previously boiled with odoriferous herbs, such as sage and lavender. After this unction they suffered the body to dry; and then repeated the operation as often as it was necessary, until the whole substance was impregnated with the preparation. When it was become very light, it was then a certain sign that it was fit and properly prepared. They then rolled it up in the dried skins of goats; which when they had a mind to save expense, they suffered to remain with the hair still growing upon them. Purchas assures us, that he has seen mummies of this kind in London; and mentions the name of a gentleman who had seen several of them in the island of Teneriffe, which were supposed to have been two thousand years old; but without any certain proofs of such great antiquity. This people, who probably came first from the coasts of Africa, might have learned this art from the Egyptians, as there was a traffic carried on from thence into the most internal parts of Africa.

Father Acosta and Garcilasso de la Vega make no doubt but that the Peruvians understood the art of preserving their dead for a very long space of time. They assert their having seen the bodies of several incas, that were perfectly preserved. They still preserved their hair and their eye-brows; but they had eyes made of gold, put in the places of those taken out. They were clothed in their usual habits, and seated in the manner of the Indians, their arms placed on their breasts. Garcilasso touched one of their fingers, and found it apparently as hard as wood; and the whole body was not heavy enough to overburden a weak man, who should attempt to carry it away. Acosta presumes that these bodies were embalmed with a bitumen of which the Indians knew the properties. Garcilasso, however, is of a different opinion, as he saw nothing bituminous about them; but he confesses that he did not examine them very particularly; and he regrets his not having inquired into the methods used for that purpose. He adds, that being a Peruvian his countrymen would not have scrupled to inform him of the secret, if they really had it still among them.

Garcilasso, thus being ignorant of the secret, makes use of some inductions to throw light upon the subject; he asserts, that the air is so dry and so cold at Cusco, that flesh dries there like wood, without corrupting; and he is of opinion, that they dried the body in snow before they applied the bitumen: he adds, that in the times of the incas, they usually dried the flesh which was designed for the use of the army; and that, when it had lost its humidity, it might be kept without salt, or any other preparation.

It is said, that at Spitzbergen, which lies within the arctic circle, and consequently in the coldest climate, bodies never corrupt nor suffer any apparent alteration, even though buried for thirty years. Nothing corrupts or putrefies in that climate; the wood which has been employed in building those houses where the train-oil is separated, appears as fresh as the day it was first cut.

If excessive cold, therefore, be thus capable of preserving bodies from corruption, it is not less certain that a great degree of dryness produced by heat, produces the same effect. It is well known that the men and animals that are buried in the sands of Arabia quickly dry up and continue in preservation for several ages, as if they had been actually embalmed. It has often happened, that whole caravans have perished in crossing those deserts, either by the burning winds that infest them, or by the sands which are raised by the tempest, and overwhelm every creature in certain ruin. The bodies of those persons are preserved entire; and they are often found in this condition by some accidental passenger. Many authors, both ancient and modern, make mention of such mummies as these; and Shaw says, that he has been assured that numbers of men, as well as other animals, have been thus preserved, for times immemorial, in the burning sands of Saibah, which is a place, he supposes, situate between Rasem and Egypt.

The corruption of dead bodies being entirely caused by the fermentation of the humours, whatever is capable of hindering or retarding this fermentation will contribute to their preservation. Both heat and cold, though so contrary in themselves, produce similar effects in this particular, by drying up the humours; the cold in condensing and thickening them, and the heat in evaporating them before they have time to act upon the solids. But it is necessary that these extremes should be constant; for if they succeed each other so as that cold shall follow heat, or dryness humidity, it must then necessarily happen that corruption must ensue.—However, in temperate climates there are natural causes capable of preserving dead bodies; among which we may reckon the quality of the earth in which they are buried. If the earth be drying and astringent, it will imbibe the humidity of the body; and it may probably be for this reason that the bodies buried in the monastery of the Cordeliers, at Thoulouse, do not putrefy, but dry in such a manner that they may be lifted up by one arm.

The gums, resins, and bitumens, with which dead bodies are embalmed, keep off the impressions which they would else receive from the alteration of the temperature of the air; and still more, if a body thus prepared be placed in a dry or burning sand, the most powerful means will be united for its preservation. We are not to be surprised, therefore, at what we are told by Chardin of the country of Chorosan, in Persia. The bodies which have been previously embalmed and buried in the sands of that country, as he assures us, are found to petrify, or, in other words, to become extremely hard, and are preserved for several ages. It is asserted that some of them have continued for a thousand years.

The Egyptians, as has been mentioned above, swathed the body with linen bands, and enclosed it in a coffin: however, it is probable that with all these precautions, they would not have continued till now, if the tombs, or pits, in which they were placed, had not been dug in a dry chalky soil, which was not susceptible of humidity; and which was besides covered over with a dry sand of several feet thickness.

The sepulchres of the ancient Egyptians subsist to this day. Most travellers who have been in Egypt have described those of ancient mummies, and have seen the mummies interred there. These catacombs are within two leagues of the ruins of the city, nine leagues from Grand Cairo, and about two miles from the village of Zaccara. They extend from thence to the Pyramids of Pharaoh, which are about eight miles distant. These sepulchres lie in a field, covered with a fine running sand, of a yellowish colour. The country is dry and hilly; the entrance of the tombs is choked up with sand; there are many open; but several more that are still concealed. The inhabitants of the neighbouring village have no other commerce or method of subsisting, but by seeking out mummies, and selling them to such strangers as happen to be at Grand Cairo. This commerce, some years ago, was not only a very common, but a very gainful one. A complete mummy was often sold for twenty pounds: but it must not be supposed that it was bought at such a high price from a mere passion for antiquity; there were much more powerful motives for this traffic. Mummy, at that time, made a considerable article in medicine; and a thousand imaginary virtues were ascribed to it, for the cure of most disorders, particularly of the paralytic kind. There was no shop, therefore, without mummy in it; and no physician thought he had properly treated his patient, without adding this to his prescription. Induced by the general repute in which this supposed drug was at that time, several Jews, both of Italy and France, found out the art of imitating mummy so exactly, that they for a long time deceived all Europe. This they did by drying dead bodies in ovens, after having prepared them with myrrh, aloes, and bitumen. Still, however, the request for mummies continued, and a variety of cures were daily ascribed to them. At length, Paræus wrote a treatise on their total inefficacy in physic; and showed their abuse in loading the stomach, to the exclusion of more efficacious medicines. From that time, therefore, their reputation began to decline; the Jews discontinued their counterfeits, and the trade returned entire to the Egyptians, when it was no longer of value. The industry of seeking after mummies is now totally relaxed, their price merely arbitrary, and just what the curious are willing to give.

In seeking for mummies, they first clear away the sand, which they may do for weeks together, without finding what is wanted. Upon coming to a little square opening, of about eighteen feet in depth, they descend into it by holes for the feet, placed at proper intervals, and there they are sure of finding what they seek for. These caves, or wells, as they call them, are hollowed out of a white free-stone, which is found in all this country, a few feet below the covering of sand. When one gets to the bottom of these, which are sometimes forty feet below the surface, there are several square openings on each side, into passages of ten or fifteen feet wide, and these lead to chambers of fifteen or twenty feet square. These are all hewn out of the rock; and in each of the catacombs are to be found several of these apartments, communicating with each other. They extend a great way under ground, so as to be under the city of Memphis, and in a manner to undermine its environs.

In some of the chambers, the walls are adorned with figures and hieroglyphics; in others, the mummies are found in tombs round the apartment hollowed out in the rock. These tombs are upright, and cut into the shape of a man, with his arms stretched out. There are others found, and these in the greatest number, in wooden coffins, or in cloths covered with bitumen. These coffins, or wrappers, are covered all over with a variety of ornaments. There are some of them painted, and adorned with figures, such as that of Death, and the leaden seals, on which several characters are engraven. Some of these coffins are carved into the human shape; but the head alone is distinguishable: the rest of the body is all of a piece, and terminated by a pedestal, while there are some with their arms hanging down; and it is by these marks that the bodies of persons of rank are distinguished from those of the meaner order. These are generally found lying on the floor, without any profusion of ornaments; and in some chambers the mummies are found indiscriminately piled upon each other, and buried in the sand.

Many mummies are found lying on their backs; their heads turned to the north, and their hands placed on the belly. The bands of linen, with which these are swathed, are found to be more than a thousand yards long; and, of consequence, the number of circumvolutions they make about the body must have been amazing. These were performed by beginning at the head, and ending at the feet; but they contrived it so as to avoid covering the face. However, when the face is entirely uncovered, it moulders into dust immediately upon the admission of the air. When, therefore, it is preserved entire, a slight covering of cloth is so disposed over it, that the shape of the eyes, the nose, and the mouth, is seen under it. Some mummies have been found with a long beard, and hair that reached down to the midleg, nails of a surprising length, and some gilt, or at least painted of a gold colour. Some are found with bands upon their breast, covered with hieroglyphics, in gold, silver, or in green; and some with tutelary idols, and other figures of jasper, within their body. A piece of gold also has often been found under their tongues, of about two pistoles value; and, for this reason the Arabians spoil all the mummies they meet with, in order to get at the gold.

But although art, or accident, has thus been found to preserve dead bodies entire, it must by no means be supposed that it is capable of preserving the exact form and lineaments of the deceased person. Those bodies which are found dried away in the deserts, or in some particular churchyards, are totally deformed, and scarcely any lineaments remain of their external structure. Nor are the mummies preserved by embalming, in a better condition. The flesh is dried away, hardened and hidden under a variety of bandages; the bowels, as we have seen, are totally removed; and from hence, in the most perfect of them, we see only a shapeless mass of skin discoloured; and even the features scarcely distinguishable. The art is, therefore, an effort rather of preserving the substance than the likeness of the deceased; and has, consequently, not been brought to its highest pitch of perfection. It appears from a mummy not long since dug up in France, that the art of embalming was more completely understood in the western world than even in Egypt. This mummy, which was dug up at Auvergne, was an amazing instance of their skill, and is one of the most curious relics in the art of preservation. As some peasants, in that part of the world, were digging in a field, near Rion, within about twenty-six paces of the highway, between that and the river Artiers, they discovered a tomb, about a foot and a-half beneath the surface. It was composed only of two stones; the one of which formed the body of the sepulchre, and the other the cover. This tomb was of free-stone, seven feet and a-half long, three feet and a-half broad, and about three feet high. It was of rude workmanship; the cover had been polished, but was without figure or inscription; within this tomb was placed a leaden coffin, four feet seven inches long, fourteen inches broad, and fifteen high. It was not made coffin-fashion, but oblong, like a box, equally broad at both ends, and covered with a lid that fitted on like a snuffbox, without a hinge. This cover had two holes in it, each of about two inches long, and very narrow, filled with a substance resembling butter; but for what purpose intended remains unknown. Within this coffin was a mummy, in the highest and most perfect preservation. The internal sides of the coffin were filled with an aromatic substance, mingled with clay. Round the mummy was wrapped a course cloth, in form of a napkin; under this were two shirts, or shrouds, of the most exquisite texture; beneath these a bandage, which covered all parts of the body, like an infant in swaddling-clothes; still under this general bandage there was another, which went particularly round the extremities, the hands, and the legs. The head was covered with two caps; the feet and hands were without any particular bandages; and the whole body was covered with an aromatic substance an inch thick. When these were removed, and the body exposed naked to view, nothing could be more astonishing than the preservation of the whole, and the exact resemblance it bore to a body that had been dead a day or two before. It appeared well-proportioned, except that the head was rather large, and the feet small. The skin had all the pliancy and colour of a body lately dead: the visage, however, was of a brownish hue. The belly yielded to the touch; all the joints were flexible, except those of the legs and feet; the fingers stretched forth of themselves when bent inwards. The nails still continued entire; and all the marks of the joints, both in the fingers, the palms of the hands, and the soles of the feet, remained perfectly visible. The bones of the arms and legs were soft and pliant; but, on the contrary, those of the skull preserved their rigidity; the hair, which only covered the back of the head, was of a chestnut colour, and about two inches long. The pericranium at top was separated from the skull by an incision, in order to open it for the introducing proper aromatics in the place of the brain, where they were found mixed with clay. The teeth, the tongue, and the ears, were all preserved in perfect form. The intestines were not taken out of the body, but remained pliant and entire, as in a fresh subject; and the breast was made to rise and fall like a pair of bellows. The embalming preparation had a very strong and pungent smell, which the body preserved for more than a month after it was exposed to the air. This odour was perceived wherever the mummy was laid; although it remained there but a very short time, it was even pretended that the peasants of the neighbouring villages were incommoded by it. If one touched either the mummy, or any part of the preparation, the hands smelled of it for several hours after, although washed with water, spirit of wine, or vinegar. This mummy, having remained exposed for some months to the curiosity of the public, began to suffer some mutilations. A part of the skin of the forehead was cut off; the teeth were drawn out, and some attempts were made to pull away the tongue. It was, therefore, put into a glass-case, and shortly after transmitted to the king of France's cabinet, at Paris.[2]

There are many reasons to believe this to be the body of a person of the highest distinction; however, no marks remain to assure us either of the quality of the person, or the time of his decease. There are only to be seen some irregular figures on the coffin; one of which represents a kind of star. There were also some singular characters upon the bandages, which were totally defaced by those who had torn them away. However, it should seem that it had remained for several ages in this state, since the first years immediately succeeding the interment, are usually those in which the body is most liable to decay. It appears also to be a much more perfect method of embalming than that of the Egyptians; as in this the flesh continues with its natural elasticity and colour, the bowels remain entire, and the joints have almost the pliancy which they had when the person was alive. Upon the whole, it is probable that a much less tedious preparation than that used by the Egyptians would have sufficed to keep the body from putrefaction; and that an injection of petreoleum inwardly, and of a layer of asphaltum without, would have sufficed to have made a mummy; and it is remarkable that Auvergne, where this was found, affords these two substances in sufficient plenty. This art, therefore, might be brought to greater perfection than it has arrived at hitherto, were the art worth preserving. But mankind have long since grown wiser in this respect; and think it unnecessary to keep by them a deformed carcase, which, instead of aiding their magnificence, must only serve to mortify their pride.

CHAP. XIV.

OF ANIMALS.

Leaving man, we now descend to the lower ranks of animated nature, and prepare to examine the life, manners, and characters, of these our humble partners in the creation. But, in such a wonderful variety as is diffused around us, where shall we begin? The number of beings endued with life, as well as we, seems, at first view, infinite. Not only the forests, the waters, the air, teem with animals of various kinds; but almost every vegetable, every leaf, has millions of minute inhabitants, each of which fills up the circle of its allotted life, and some are found objects of the

[2] In March 1813, the body of Charles I. was found embalmed, and in a very high state of preservation, in a leaden coffin in St. George's chapel, Windsor, when the men were cleaning out the vault for the reception of the remains of the duchess of Brunswick.—A vault was accidentally discovered by the sexton, under the old parish-church of Kilsyth, in Scotland; on descending a flight of steps he discovered a leaden coffin, in which were embalmed, and in every respect in high preservation, the bodies of Lady Kilsyth and her infant son, who were both killed by the fall of a house on the Continent, where they were embalmed, and sent home to the family burying-place. This circumstance happened upwards of a hundred and fifty years ago.—Ed.

greatest curiosity. In this seeming exuberance of animals, it is natural for ignorance to lie down in hopeless uncertainty, and to declare what requires labour to particularize to be utterly inscrutable. It is otherwise, however, with the active and searching mind; no way intimidated with the immense variety, it begins the task of numbering, grouping, and classing, all the various kinds that fall within its notice; finds every day new relations between the several parts of the creation; acquires the art of considering several at a time under one point of view; and, at last, begins to find that the variety is neither so great nor so inscrutable as was at first imagined. As in a clear night, the number of the stars seems infinite; yet, if we sedulously attend to each in its place, and regularly class them, they will soon be found to diminish, and come within a very scanty computation.

Method is one of the principal helps in natural history, and without it very little progress can be made in this science. It is by that alone we can hope to dissipate the glare, if I may so express it, which arises from a multiplicity of objects at once presenting themselves to the view. It is method that fixes the attention to one point, and leads it, by slow and certain degrees, to leave no part of nature unobserved.

All naturalists, therefore, have been very careful in adopting some method of classing or grouping the several parts of nature; and some have written books of natural history with no other view. These methodical divisions some have treated with contempt,[1] not considering that books, in general, are written with opposite views; some to be read, and some only to be occasionally consulted. The methodists in natural history seem to be content with the latter advantage; and have sacrificed to order alone, all the delights of the subject, all the arts of heightening, awakening, or continuing curiosity. But they certainly have the same use in science that a dictionary has in language; but with this difference, that in a dictionary we proceed from the name to the definition; in a system of natural history, we proceed from the definition to find out the thing. Without the aid of system, nature must still have lain undistinguished, like furniture in a lumber-room: everything we wish for is there indeed, but we know not where to find it. If, for instance, in a morning excursion, I find a plant, or an insect, the name of which I desire to learn; or, perhaps, am curious to know whether already known; in this inquiry I can expect information only from one of these systems, which, being couched in a methodical form, quickly directs me to what I seek for. Thus we will suppose that our inquirer has met with a spider, and that he has never seen such an insect before. He is taught by the writer of a system[2] to examine whether it has wings; and he finds that it has none. He, therefore, is to look for it among the wingless insects, or the Aptera, as Linnæus calls them; he then is to see whether the head and breast make one part of the body, or are disunited: he finds they make one: he is then to reckon the number of feet and eyes; and he finds that it has eight of each. The insect, therefore, must be either a scorpion or a spider; but he lastly examines its feelers, which he finds clavated, or clubbed; and, by all these marks, he at last discovers it to be a spider. Of spiders, there are forty-seven sorts; and, by reading the description of each, the inquirer will learn the name of that which he desires to know. With the name of the insect, he is also directed to those authors that have given any account of it, and the page where that account is to be found; by this means he may know at once what has been said of that animal by others, and what there is of novelty in the result of his own researches.

From hence it will appear how useful those systems in natural history are to the inquirer; but, having given them all their merit, it would be wrong not to observe, that they have, in general, been very much abused. Their authors, in general, seem to think that they are improvers of natural history, when in reality they are but guides; they seem to boast that they are adding to our knowledge, while they are only arranging it. These authors, also, seem to think that the reading of their works and systems is the best method to attain a knowledge of nature; but setting aside the impossibility of getting through whole volumes of a dry long catalogue, the multiplicity of whose contents is too great for even the strongest memory, such works rather tell us the names than the history of the creature we desire to inquire after. In these dreary pages, every insect or plant, that has a name, makes as distinguished a figure as the most wonderful, or the most useful. The true end of studying nature is to make a just selection, to find those parts of it that most conduce to our pleasure or convenience, and to leave the rest in neglect. But these systems, employing the same degree of attention upon all, give us no opportunities of knowing which most deserves attention; and he who has made his knowledge from such systems only, has his memory crowded with a number of trifling or minute particulars, which it should be his business and his labour to forget. These books, as was said before, are useful to be consulted, but they are very unnecessary to be read; no inquirer into nature should be without one of them; and, without any doubt, Linnæus deserves the preference.

One fault more, in almost all these systematic writers, and that which leads me to the subject of the present chapter, is, that seeing the necessity of methodical distribution in some parts of nature, they have introduced it into all. Finding the utility of arranging plants, birds, or insects, they have arranged quadrupeds also with the same assiduity; and although the number of these is so few as not to exceed two hundred,[3] they have darkened the subject with distinctions and divisions, which only serve to puzzle and perplex. All method is only useful in giving perspicuity, where the subject is either dark or copious: but with regard to quadrupeds, the number is but few; many of them we are well acquainted with by habit; and the rest may very readily be known without any method. In treating of such, therefore, it would be useless to confound the reader with a multiplicity of divisions; as quadrupeds are conspicuous enough to obtain the second rank in nature, it becomes us to be acquainted with, at least, the names of them all. However, as there are naturalists who have gained a name from the excellence of their methods, in classing these animals, some readers may desire to have a knowledge of what has been laboriously invented for their instruction. I will just take leave, therefore, to mention the most applauded methods of classing animals, as adopted by Ray, Klein, and Linnæus; for it often happens, that the terms which have been long used in a science, though frivolous, become, by prescription, a part of the science itself.

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[1] Mr. Buffon, in his Introduction, &c.

[2] Linnæus.

Ray, after Aristotle, divides all animals into two kinds; those which have blood, and those which are bloodless. In the last class, he places all the insect tribes. The former he divides into such as breathe through the lungs, and such as breathe through gills: these last comprehend the fishes. In those which breathe through the lungs, some have the heart composed of two ventricles, and some have it of one. Of the last are all animals of the cetaceous kind, all oviparous quadrupeds, and serpents. Of those that have two ventricles, some are oviparous, which are the birds; and some are viviparous, which are quadrupeds. The quadrupeds he divides into such as have a hoof, and such as are claw-footed. Those with the hoof, he divides into such as have it undivided, such as have it cloven, and such as have the hoof divided into more parts, as the rhinoceros and hippopotamus. Animals with the cloven hoof, he divides into such as chew the cud, as the cow and the sheep; and such as are not ruminant, as the hog. He divides those animals that chew the cud, into four kinds: the first have hollow horns, which they never shed, as the cow; the second is of a less species, and is of the sheep kind; the third is of the goat kind; and the last, which have solid horns, and shed them annually, are of the deer kind. Coming to the claw-footed animals, he finds some with large claws, resembling the fingers of the human hand; and these he makes the ape kind. Of the others, some have the foot divided in two, and have a claw to each division; these are the camel kind. The elephant makes a kind by itself, as its claws are covered over by a skin. The rest of the numerous tribe of claw-footed animals, he divides into two kinds; the analogous, or such as resemble each other; and the anomalous, which differ from the rest. The analogous claw-footed animals are of two kinds: they have more than two cutting teeth in each jaw, such as the lion and the dog, which are carnivorous; or they have but two cutting teeth in each jaw; and these are chiefly fed upon vegetables. The carnivorous kinds are divided into the great and the little. The great carnivorous animals are divided into such as have a short snout, as the cat and the lion; and such as have it long and pointed, as the dog and the wolf. The little claw-footed carnivorous animals differ from the great, in having a proportionably smaller head, and a slender body, that fits them for creeping into holes, in pursuit of their prey, like worms; and they are therefore called the vermin kind.

We see, from this sketch of division and subdivision, how a subject, extremely delightful and amusing in itself, may be darkened and rendered disgusting. But, notwithstanding, Ray seems to be one of the most simple distributors; and his method is still, and not without reason, adopted by many. Such as have been at the trouble to learn this method, will certainly find it useful: nor would we be thought, in the least, to take from its merits; all we contend for is, that the same information may be obtained by a pleasanter and an easier method.

It was the great success of Ray's method, that soon after produced such a variety of attempts in the same manner; but almost all less simple, and more obscure. Mr. Klein's method is briefly as follows; he makes the power of changing place, the characteristic mark of animals in general; and he takes their distinctions from their aptitude and fitness for such a change. Some change place by means of feet, or some similar contrivance; others have wings and feet: some can change place only in water, and have only fins: some go upon earth, without any feet at all: some change place, by moving their shell; and some move only at a certain time of the year. Of such, however, as do not move at all, he takes no notice. The quadrupeds that move chiefly by means of four feet upon land he divides into two orders. The first are the hoofed kind; and the second, the claw kind. Each of these orders is divided into four families. The first family of the hoofed kind, are the single hoofed, such as the horse, ass, &c. The second family are such as have the hoof cloven into two parts, such as the cow, &c. The third family have the hoof divided into three parts, and in this family is found only the rhinoceros. The fourth family have the hoof divided into five parts; and in this is only to be found the elephant. With respect to the clawed kind, the first family comprehends those that have but two claws on each foot, as the camel; the second family have three claws; the third, four; and the fourth, five. This method of taking the distinctions of animals from the organs of motion, is ingenious; but it is, at the same time, incomplete; and, besides, the divisions into which it must necessarily fall are inadequate; since, for instance, in his family with two claws, there is but one animal; whereas, in his family with five claws, there are above a hundred.

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[3] In Dr. Shaw's General Zoology, the number of quadrupeds, not including the cetaceous and seal tribes, amount to five hundred and twelve, besides their varieties.—ED.

Brisson, who has laboured this subject with great accuracy, divides animated nature into nine classes: namely, quadrupeds; cetaceous animals, or those of the whale kind; birds; reptiles, or those of the serpent kind: cartilaginous fishes; spinous fishes; shelled animals; insects; and worms. He divides the quadrupeds into eighteen orders; and takes their distinctions from the number and form of their teeth.

But of all those whose systems have been adopted and admired, Linnæus is the foremost; as, with a studied brevity, his system comprehends the greatest variety in the smallest space.

According to him, the first distinction of animals is to be taken from their internal structure. Some have the heart with two ventricles, and hot red blood; namely, quadrupeds and birds. The quadrupeds are viviparous, and the birds oviparous.

Some have the heart with but one ventricle, and cold red blood; namely, amphibia and fishes. The amphibia are furnished with lungs; the fishes with gills.

Some have the heart with one ventricle, and cold white serum; namely, insects and worms; the insects have feelers; and the worms, holders.

The distinctions of quadrupeds or animals with paps, as he calls them, are taken from their teeth. He divides them into seven orders; to which he gives names that are not easy of translation: Primates, or principles, with four cutting teeth in each jaw; Bruta, or brutes, with no cutting teeth; Feræ, or wild beasts, with generally six cutting teeth in each jaw; Glires, or dormice, with two cutting teeth, both above and below; Pecora, or cattle, with many cutting teeth above, and none below; Belluæ, or beasts, with the foreteeth blunt; Cete, or those of the whale kind, with cartilaginous teeth. I have but just sketched out this system, as being, in its own nature, the closest abridgment: it would take volumes to dilate it to its proper length. The names of the different animals, and their classes, alone make two thick octavo volumes; and yet nothing is given but the slightest description of each. I have omitted all criticism also upon the accuracy of the preceding systems; this has been done both by Buffon and Daubenton, not with less truth than humour; for they had too much good sense not to see the absurdity of multiplying the terms of science to no end, and disappointing our curiosity rather with a catalogue of nature's varieties, than a history of nature.[4]

Instead, therefore, of taxing the memory and teasing the patience with such a variety of divisions and subdivisions, I will take leave to class the productions of nature in the most obvious, though not in the most accurate, manner. In natural history, of all other sciences, there is the least danger of obscurity. In morals, or in metaphysics, every definition must be precise, because those sciences are built upon definitions; but it is otherwise in those subjects where the exhibition of the object itself is always capable of correcting the error. Thus it may often happen, that in a lax system of natural history, a creature may be ranked among quadrupeds that belongs more properly to the fish or the insect classes. But that can produce very little confusion, and every reader can thus make a system the most agreeable to his own imagination. It will be of no manner of consequence whether we call a bird or an insect a quadruped, if we are careful in marking all its distinctions: the uncertainty in reasoning, or thinking, that these approximations of the different kinds of animals produce, is but very small, and happens but very rarely; whereas the labour that naturalists have been at to keep the kinds asunder, has been excessive. This, in general, has given birth to that variety of systems which we have just mentioned, each of which seems to be almost as good as the preceding.

Taking, therefore, this latitude, and using method only where it contributes to conciseness or perspicuity, we shall divide animated nature into four classes; namely, Quadrupeds, Birds, Fishes, and Insects. All these seem in general pretty well distinguished from each other by nature; yet there are several instances in which we can scarcely tell whether it is a bird or a quadruped that we are about to examine; whether it is a fish or an insect that offers to our curiosity. Nature is varied by imperceptible gradations, so that no line can be drawn between any two classes of its productions, and no definition made to comprehend them all. However, the distinctions between these classes are sufficiently marked, and their encroachments upon each other are so rare, that it will be sufficient particularly to apprize the reader when they happen to be blended.

There are many quadrupeds that we are well acquainted with; and of those we do not know, we shall form the most clear and distinct conceptions, by being told wherein they differ, and wherein they resemble those with which we are familiar. Each class of quadrupeds may be ranged under some one of the domestic kinds, that may serve for the model by which we are to form some kind of idea of the rest. Thus we may say that a tiger is of the cat kind, a wolf of the dog kind, because there are some rude resemblances between each; and a person who has never seen the wild animals, will have some incomplete knowledge of their figure from the tame ones. On the contrary, I will not, as some systematic writers have done,[5] say that the bat is of the human kind, or a hog of the horse kind, merely because there is some resemblance in their teeth, or their paps. For although this resemblance may be striking enough, yet a person who has never seen a bat or a hog, will never form any just conception of either by being told of this minute similitude. In short, the method in classing quadrupeds should be taken from their most striking resemblances; and where these do not offer, we should not force the similitude, but leave the animal to be described as a solitary species. The number of quadrupeds is so few, that indeed, without any method whatever, there is no great danger of confusion.

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[4] See Supplementary Note to this Chapter, p. 257.

All quadrupeds, the number of which, according to Buffon, amounts to but two hundred, may be classed in the following manner.

First, those of the Horse kind. This class contains the Horse, the Ass, and the Zebra. Of these none have horns, and their hoof is of one solid piece.

The second class are those of the Cow kind; comprehending the Urus, the Buffalo, the Bison, and the Bonassus. These have cloven hoofs, and chew the cud.

The third class is that of the Sheep kind; with cloven hoofs, and chewing the cud like the former. In this is comprehended the Sheep, the Goat, the Lama, the Vigogne, the Gazelle, the Guinea Deer, and all of a similar form.

The fourth class is that of the Deer kind, with cloven hoofs, and with solid horns, that are shed every year. This class contains the Elk, the Rein-deer, the Stag, the Buck, the Roe-buck, and the Axis.

The fifth class comprehends all those of the Hog kind, the Peccari, and the Babyrouessa.

The sixth class is that numerous one of the Cat kind. This comprehends the Cat, the Lion, the Panther, the Leopard, the Jaguar, the Cougar, the Jaguarette, the Lynx, the Ounce, and the Catamountain. These are all carnivorous, and furnished with crooked claws, which they can sheathe and unsheathe at pleasure.

The seventh class is that of the Dog kind, carnivorous, and furnished with claws like the former, but which they cannot sheathe. This class comprehends the Dog, the Wolf, the Fox, the Jackal, the Isatis, the Hyæna, the Civet, the Gibet, and the Genet.

The eighth class is that of the Weasel kind, with a long small body, with five toes, or claws, on each foot; the first of them separated from the rest like a thumb. This comprehends the Weasel, the Martin, the Pole-cat, the Ferret, the Mangoust, the Vansire, the Ermine, with all the varieties of the American Moufettes.

The ninth class is that of the Rabbit kind, with two large cutting teeth in each jaw. This comprehends the Rabbit, the Hare, the Guinea-pig, all the various species of the Squirrel, the Dormouse, the Marmotte, the Rat, the Mouse, the Agouti, the Paca, the Aperea, and the Tapeti.

The tenth class is that of the Hedge-hog kind, with claw-feet, and covered with prickles; comprehending the Hedge-hog and the Porcupine, the Couando and the Urson.

The eleventh class is that of the Tortoise kind, covered with a shell, or scales. This comprehends the Tortoise, the Pangolin, and the Phataguin.

The twelfth is that of the Otter, or amphibious kind; comprehending the Otter, the Beaver, the Desman, the Morse, and the Seal.

The thirteenth class is that of the Ape and Monkey kinds, with hands, and feet resembling hands.

The fourteenth class is that of winged quadrupeds, or the Bat kind; containing the Bat, the Flying Squirrel, and some other varieties.

The animals which seem to approach no other kind, either in nature or in form, but to make each a distinct species in itself, are the following: the Elephant, the Rhinoceros, the Hippopotamus, the Camelopard, the Camel, the Bear, the Badger, the Tapir, the Cabrai, the Coati, the Ant-bear, the Tatou, and, lastly, the Sloth.

All other quadrupeds, whose names are not set down, will be found among some of the above-mentioned classes, and referred to that which they most resemble. When, therefore, we are at a loss to know the name of any particular animal, by examining which of the known kinds it most resembles, either in shape, or in hoofs, or claws, and then examining the particular description, we shall be able to discover not only its name, but its history. I have already said, that all methods of this kind are merely arbitrary, and that Nature makes no exact distinction between her productions. It is hard, for instance, to tell whether we ought to refer the civet to the dog or the cat kind; but, if we know the exact history of the civet, it is no great matter to which kind we shall judge it to bear the greatest resemblance. It is enough, that a distribution of this kind excites in us some rude outlines of the make, or some marked similitudes in the nature of these animals; but to know them with any precision, no system, or even description, will serve, since the animal itself, or a good print of it, must be seen, and its history be read at length, before it can be said to be known. To pretend to say that we have an idea of a quadruped, because we can tell the number or the make of its teeth, or its paps, is as absurd as if we should pretend to distinguish men by the buttons on their clothes.[6] Indeed it often happens that the

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[5] Linnæi Syst.

[6] Goldsmith little dreamt, when penning such a sentence as this, of what might be achieved by such a knowledge of comparative anatomy as Cuvier's immortal work is founded on.—ED.

ped itself can be but seldom seen; that
f the more rare kinds do not come into
above once in an age, and some of them
ever been able to bear the removal; in
case, therefore, there is no other sub-
but a good print of the animal, to give
of its figure; for no description whatso-
answer this purpose so well. Mr. Locke,
s usual good sense, has observed, that a
of the animal, taken from the life, is one of
t methods of advancing natural history;
; most of our modern systematic writers
tent rather with describing. Descriptions,
bt, will go some way towards giving an
the figure of an animal; but they are
y much the longest way about, and, as
e usually managed, much the most ob-
In a drawing we can, at a single glance,
more instruction than by a day's painful
ation of methodical systems, where we
l the proportions with great exactness,
remain ignorant of the totality. In fact,
ethod of describing all things is a fault
s infected many of our books, that treat
meaner arts, for this last age. They at-
o teach by words, what is only to be learnt
tice and inspection. Most of our diction-
nd bodies of arts and sciences, are guilty
error. Suppose, for instance, it be re-
to mention the manner of making shoes,
in that all the verbal instructions in the
will never give an adequate idea of this
art, or teach a man to become a shoe-
A day or two in a shoemaker's shop will
the end better than a whole folio of in-
n, which only serves to oppress the learner
he weight of its pretended importance.
e lately seen a laborious work carried on
s, with this only intent, of teaching all
des by description: however, the design
blush seems to be ill considered; and it
able that very few advantages will be de-
rom so laborious an undertaking. With
to the descriptions in natural history,
without all question, under the direction
sense, are necessary; but still they should
t within proper bounds; and, where a
ay be much more easily shown than de-
, the exhibition should ever precede the
t.

—*Of the Linnæan and Cuvierian systems. General view of the class Mammalia.*

ms are conventional arrangements, to enable
sts to classify species, so that their identity
traced, compared, and investigated. As new
were discovered, the task of ascertaining
ecame so difficult and uncertain that the ne-
of systems was apparent. Accordingly, sys-
arrangement was practised to a limited ex-
ore the time of Linnæus: but to him we are
l for the production of a new and comprehen-
ssification. He reduced all natural objects
ee great divisions, which he called *kingdoms;*
Animal, the Vegetable, and *the Mineral kingdom.* These kingdoms he redivided into *classes, orders, genera, species,* and *varieties.*

A plurality of species constitute a genus; a variety of genera an order; and several orders a class. When, therefore, an object with which we are totally unacquainted presents itself, our first business is to consider what is the class to which it belongs. Having ascertained this, we next compare it with the characters of the orders; and having determined to which it is allied, we proceed to investigate its generic characters. When we have satisfied ourselves as to this, we come to the last and most difficult point, namely the discovery of its species, which often rests on very trivial distinctions.

The '*Systema Naturæ*' of Linnæus laid the foundation on which almost all succeeding systems have been built. He arranged the ANIMAL KINGDOM into six classes as follow:

CLASS I.—MAMMALIA.

Order 1. Primates
2. Bruta
3. Feræ
4. Glires
5. Pecora
6. Belluæ
7. Cete

CLASS II.—AVES.

Order 1. Accipitres
2. Picæ
3. Anseres
4. Grallæ
5. Gallinæ
6. Passeres

CLASS III.—AMPHIBIA.

Order 1. Reptilia
2. Serpentes
3. Nantes

CLASS IV.—PISCES.

Order 1. Apodes
2. Jugulares
3. Thoracci
4. Abdominales

CLASS V.—INSECTA.

Order 1. Coleoptera
2. Hemiptera
3. Lepidoptera
4. Neuroptera
5. Hymenoptera
6. Dyptera
7. Aptera

CLASS VI.—VERMES.

Order 1. Intestina
2. Mollusca
3. Testacea
4. Lythophyta
5. Zoophyta

To this system may be attributed, in a great measure, the rapid progress which Natural History has made since the time of Linnæus. The first outline appeared in 1748, and was perfected in the 12th edition of the '*Systema Naturæ,*' published in 1766. This system was improved by Blumenbach, in his 'Manual of Comparative Anatomy,' first published in 1803.

The modern discoveries, however, by Cuvier, Geoffroy, Lamarck, and other French comparative anatomists, have pointed out the necessity of substituting other arrangements. Among all the various systems which have been devised, that of Cuvier seems to approach nearest to the natural affinities, especially in his class *Mammalia*, which is that we have adopted, with the addition of some new genera, possessing decided characters.

Cuvier separates all known animals into four great divisions, namely, I. VERTEBRATED ANIMALS; II. MOLLUSCOUS ANIMALS; III. ARTICULATED ANIMALS; and, IV. RADIATED ANIMALS. The foundation of these divisions rests on the organization of the various animals as they exist in nature. This division has been already noticed in the Introductory article to the present edition of Goldsmith, pp. xxxv—xxxviii. The first great division of the vertebrated animals is that of the Mammalia, to which the Second Part of the present edition of 'The History of Animated Nature' is devoted.

The mammalia should be placed at the head of the animal kingdom, not only because it is the class to which man himself belongs, but because it surpasses all others in the enjoyment of more numerous faculties, of more delicate sensations, of a greater variety of motions, and where all these properties are combined so as to form beings of greater intelligence, fruitful in resources, less the slaves of instinct, and more susceptible of improvement. This class possesses characteristics peculiar to itself, in its viviparous generation [the young being born alive], in the manner by which the fœtus [or embryo] is nourished in the womb, by means of the placenta, and in the mammæ, or breasts, by which the young are suckled. On the contrary, the other classes are oviparous [or produced from eggs previously laid by the parent]; and if we contrast them generally with the mammalia, we shall find that they possess numerous points of resemblance among themselves, which clearly exhibit a special plan of organization in the general system of the vertebrated animals. As the degree of their respiration is moderate, the mammalia are in general adapted for walking upon the ground, but at the same time their movements are performed with vigour, and in a continuous manner. For this reason, the articulations of their skeletons have very precise forms, which determine the direction and extent of their motions with precision. Some of them can, however, raise themselves in the air by means of elongated limbs, connected by extensible membranes; others have their limbs so much shortened that they cannot move easily except in the water. But this circumstance by no means deprives these last-mentioned animals of the general characters of the class.

The young are nourished for some time after their birth by milk,—a fluid peculiar to this class, and produced by Mammæ or breasts. This secretion commences at the moment of birth, and continues as long afterwards as the young may require. It is from these mammæ that the class has obtained its name of Mammiferes, or Mammalia. This being a characteristic peculiar to the animals composing this class, serves to distinguish them more precisely from the remaining classes than any other external character.

It remains, however, still doubtful whether the Monotremata possess mammæ or not. Meckel could find no traces of mammæ in the male Ornythorhynchus, but thought he perceived them in the female. "I detected, on the right side of the abdominal muscles," he observes, "a small round mass, which at first bore the appearance of a portion of intestine accidentally pushed into this situation. I was satisfied that this gland was a true mamma, an opinion which was more forcibly impressed upon my mind from its structure and situation, from its marked development in the female, and the want of it in the male, or at least its existence in so minute a degree as to have hitherto eluded the closest examination." Oken and De Blainville asserted, *a priori*, and without having ever examined a female Ornythorhynchus, that its mammæ must exist, and would no doubt be discovered hereafter, on account of the very numerous analogies which this animal presents to the other Mammalia. Sir Everard Home describes the Mammæ of the Ornythorhynchus in the 'Philosophical Transactions' for 1802. On the other hand, M. Geoffroy considers that these organs are not real mammæ, but are analogous only to the lateral glands of the muscardin (*Myoxus Avellanarius*). Again, the Ornithorhynchus is either oviparous, or ovo-viviparous, which properties are always connected with the absence of mammæ, and its bill evidently appears unfitted for sucking; so that, upon the whole, it must still be considered as doubtful whether these organs really perform the functions of mammæ. Although the mammæ are always found, with the above exception, in the females, yet the males of many species are destitute of them, as the Hamster (*Cricetus Vulgaris*), and the *Lemur mongoz*, while in some others, as the horse, they are found in an usual situation. The mammæ are frequently less numerous in the male than in the female. Milk has often been secreted in the breasts of men, as well as of other male animals, such as the goat, ox, dog, cat, and hare. Blumenbach describes a he-goat which it was necessary to milk every other day for the space of a year. It is very common to find milk in the breasts of newly-born children of both sexes; and the same circumstance has likewise been observed in the calf and foal. In the cetacea and marsupialia, the mammæ do not project so as to form udders or breasts, but they lie flat under the skin. In general the mammæ are very observable only during the period of suckling, at which time they are largely distended with milk, except in those animals having them placed upon the chest, when they possess that graceful and delicate form observable in the human female of the Caucasian race during the bloom of youth. It is very difficult to discover them in the marsupial animals, except at the period when the young are actually contained in the abdominal pouch of the female. The number, as well as the position of the mammæ, varies greatly in different animals. It would appear that there are frequently twice as many teats as the number of young usually produced by each animal. Yet this rule is not without several exceptions, among which may be included the Guinea-pig (*Cavia cobaia*), and the domestic sow. Indeed it is among the domesticated races that these exceptions are chiefly found. Thus, according to Buffon, the mammæ of the sow vary from ten to twelve; of the cow from four to six; of the rat from eight to ten. The mare and ewe may have from two to four, while the ferret sometimes has three on the right side, and four on the left. From these examples we may readily perceive that no fixed law is observed in the number of the mammæ.

Those variable characters which establish the essential differences of the mammalia among themselves, are derived jointly from the organs of touch and from those of mastication. The forms of the hands or feet chiefly determine the degree of their agility and dexterity, while those of their teeth not only correspond to the nature of their aliments, but draw along with them innumerable other distinctions, relative to the digestive organs, and even to the intellectual functions. The degree of perfection in the organ of touch is estimated by the number of the fingers, their capability of motion, and the extent in which their extremities are enveloped in a nail or hoof. A hoof which entirely surrounds that extremity of the finger nearest to the ground, blunts its sense of touch, and renders it incapable of grasping an object. The opposite character is found in the nail, composed of a single layer, which covers the one side only of the extremity, and leaves to the other the utmost sensibility of touch. The nature of their ordinary food is determined by the form of the molar or cheek teeth, and this always corresponds to the mode in which the jaws are articulated. In order to cut flesh, the molars must be serrated or saw-like, and the jaws united in the manner of scissors, which can only open and shut. On the contrary, in order to crush grains, it is necessary that they should have molars with flat crowns, and jaws capable of moving horizontally. It is also requisite that the crown of these teeth should possess that kind of inequality which the millstone acquires, that its substance should be of different degrees of hardness, and that some of its parts should wear away more rapidly than others.

All animals with hoofs [thence called ungulated] must of necessity be herbivorous, that is, possessed of molar teeth with flat crowns, because the structure of their feet prevents them from seizing a living prey. It is different with those animals said to be unguiculated, from their possessing nails. They are susceptible of several varieties, and may partake of different species of food; but they differ still more from each other in the extent of motion possessed by the fingers, and the delicacy of their touch. There is one characteristic which exercises a mighty influence on the degree of their address and means of industry—that is, the power of opposing the thumb to the other fingers, for the purpose of seizing small objects, which constitutes it a hand, properly so called. It is in man, whose fore-extremity is entirely free, and capable of being employed in seizing, grasping, or holding, that this power reaches its limit of perfection. These different combinations, which determine rigorously the nature of the different mammalia, have given rise to their subdivision into the following orders:—

I. THE UNGUICULATED MAMMALIA.

1. BIMANA.—Man alone possesses hands solely at his fore-extremities, and at the same time is privileged in many other respects, so as to entitle him to the first place among the unguiculated animals; his lower extremities alone support his body in a vertical position.

2. QUADRUMANA.—The order next to man possesses hands at all the four extremities.

3. CARNASSIERS.—The third order has not the thumb free and opposable to the other anterior extremities.

All the animals of the above orders possess three kinds of teeth, namely, molars, canines, and incisors.

4. RODENTIA.—The fourth order differs but slightly in the structure of the fingers from the Carnassiers, but it wants the canine teeth, and the incisors are disposed in front for the peculiar kind of mastication, termed gnawing.

5. EDENTATA.—Next follow those animals having the fingers very much confined, and deeply sunk into large nails, which are often very crooked. They also have the imperfection of wanting incisors. Some also want the canines, and others have no teeth at all.

6. MARSUPIALIA.—This distribution of the unguiculated animals would have been perfect, and might form a chain of some regularity, if New Holland [and America] had not furnished us with a small collateral chain, composed of animals with pouches. All these genera resemble each other in the whole character of their organization, yet some of them correspond to the Carnassiers by the structure of their teeth, and the nature of their food; others agree with Rodentia in these particulars, and others again with the Edentata.

II. THE UNGULATED MAMMALIA.

The animals with hoofs are less numerous, and at the same time less various in their structure.

7. PACHYDERMATA, or Jumenta, comprise all the hoofed animals which do not ruminate. The elephant, though included in this class, would properly form a class of itself, which is allied to the Rodentia by some remote analogies.

8. RUMINANTIA.—The ruminating animals form a very well-marked order, from their cloven feet, their four stomachs, and the absence of true incisors in the upper jaw.

III. THE SEA-BEASTS.

9. CETACEA.—Finally, we arrive at the Mammalia altogether destitute of hinder extremities. From their partaking of the form of the fishes, and their aquatic life, we should be led to constitute them a separate class, did not the remainder of their economy resemble the Mammalia in every respect. These are the fishes with warm blood of the ancients [the sea-beasts of the present day], which unite the strength of the other Mammalia to the advantage of being sustained by the watery element. It is accordingly in this class that the most gigantic animals are found.

In those superficial characters, which strike the observer most forcibly at first sight, the mammalia present many traits which are to be found equally in the other classes, a fact which is not sufficiently adverted to in ordinary discourse. Thus, by the term beast or quadruped, it is usual to understand an animal covered with hair, and having four feet; and whenever a bird or a fish is referred to, the feathers of the former and the scales of the latter offer themselves readily to the imagination. Yet these external characters by no means serve to distinguish the class of vertebrated animals. The property of having four feet, which is possessed by a large and important portion of the mammalia, is not confined solely to them. Many oviparous animals belonging to the third class (*Reptilia*) possess the same characteristic; and in this respect the four-footed beasts of the earth, which approach Man so nearly in their other characters, and occupy so high a place in the economy of Nature, are not superior to the lizards and frogs. Again, the armadilloes (*Dasypus*), instead of being covered with hair, are armed with a solid covering like the Tortoises, or even like the Crustacea. The animals of the genus manis are covered with scales not very different from those of the fishes, and the same structure is found in the tail of the beaver (*Castor faber*). The porcupines (*Hystrix*), and the hedgehogs (*Erinaceus*), are covered with a species of sharp quills, without feathery fibres on the extremity, but having the tube very like that of birds. The cetacea, or sea-beasts, resemble the fishes so forcibly in their external forms, that the uninformed portion of mankind persist in calling them fishes in opposition to the universal decision of naturalists. The whale, dolphin, grampus, and other animals of this order, have nothing in common with the fish, except the circumstances of their living in the same element, in being destitute of hair, and in possessing that external form necessary for rapid motion in a fluid of considerable density. Yet the term whale-fishery will long preserve its usage among that numerous class of persons, who are apt to reject the critical observations of naturalists, from their apparent over-refinement. Nature appears to evade, by the variety of her combinations, those obvious divisions which a superficial examination would lead us to form; and the mammalia approach to the birds, the reptiles, the fishes, and even the crustacea in the character of their external covering. This variety in the superficial appearance establishes clearly the necessity of seeking, in their internal organization, for the principles of classification. It has often been stated, that while error lies on the surface, truth must be sought deeply in the hidden parts; and this assertion, which is only made metaphorically in reference to moral subjects, is literally true in Natural History.

The birds share their quills with the hedgehogs and porcupines; and their long bills destitute of teeth, with their tongue, are imitated by the trunk and tongue of the ant-eaters (*Myrmecophaga*). The reptiles are not alone armed with a solid covering. The fishes share their scales with the beaver and manis, and their fins with the seals (*Phoca*), the morse (*Trichechus*), the manatus, and the true cetacea. The birds have their powers of flight assigned also to the bat; the crawling of the reptiles and eels is imitated in some degree by the slow movements of the sloth (*Bradypus*); and the fishes share their powers of swimming with most mammalia, but more especially with the tribe amphibia, and order cetacea.

As the meanings of the terms *beast*, *bird*, *fish*, and *quadruped*, are established by popular usage alone, they are necessarily destitute of that precision which should characterize the language of science. The term *mammalia*, which has been generally adopted by Naturalists, is much more wide in its signification than that of *quadruped*; it agrees more nearly with the word *beast* than perhaps any other term, although not exactly, as the latter term excludes man, and the cetacea are not always understood by the vulgar to be really sea-beasts. The term *quadruped* is still more improperly considered as synonymous with *mammalia*, with which, however, it is often confounded. In the last-mentioned class man is included as well as the cetacea, although *he* is a *biped*, and *they* are altogether destitute of hinder limbs. The ape tribes possessed of four hands are properly *quadrumanous*. Even of those animals which are, strictly speaking, quadrupeds, from their walking habitually on four feet, many either frequent the water or are capable of supporting themselves in the air. The seals and other amphibia, although mammalia, cannot properly be styled quadrupeds, and the same observation applies to the bats. The true quadrupeds live exclusively on the land; they may be said to divide it with man, whose nature they approach more nearly than that of the birds, reptiles, or fishes. Man is the only biped and bimanous animal, because he alone possesses two feet and two hands.

CHAP. XV.

OF QUADRUPEDS IN GENERAL, COMPARED TO MAN.

UPON comparing the various animals of the globe with each other, we shall find that quadrupeds demand the rank immediately next ourselves; and, consequently, come first in consideration. The similitude between the structure of their bodies and ours, those instincts which they enjoy in a superior degree to the rest, their constant services, or their unceasing hostilities, all render them the foremost objects of our curiosity, the most interesting parts of animated nature. These, however, although now so completely subdued, very probably, in the beginning, were nearer upon an equality with us, and disputed the possession of the earth. Man, while yet savage himself, was but ill qualified to civilize the forest. While yet naked, unarmed, and without shelter, every wild beast was a formidable rival; and the destruction of such was the first employment of heroes. But when he began to multiply, and the arts to accumulate, he soon cleared the plains of the most noxious of these his rivals; a part was taken under his protection and care, while the rest found a precarious refuge in the burning desert or the howling wilderness.

From being rivals, quadrupeds have now become the assistants of man; upon them he devolves the most laborious employments, and finds in them patient and humble coadjutors, ready to obey, and content with the smallest retribution. It was not, however, without long and repeated efforts that the independent spirit of these animals was broken; for the savage freedom, in wild animals, is generally found to pass down through several generations before it is totally subdued. Those cats and dogs that are taken from a state of natural wildness in the forest, still transmit their fierceness to their young; and, however concealed in general, it breaks out upon several occasions. Thus the assiduity and application of man in bringing them up, not only alters their disposition, but their very forms; and the difference between animals in a state of nature and domestic tameness, is so considerable, that Mr. Buffon has taken this as a principal distinction in classing them.

In taking a cursory view of the form of quadrupeds, we may easily perceive, that of all the ranks of animated nature, they bear the nearest resemblance to man. This similitude will be found more striking when, erecting themselves on their hinder feet, they are taught to walk forward in an upright posture. We then see that all their extremities in a manner correspond with ours, and present us with a rude imitation of our own. In some of the ape kind the resemblance is so striking, that anatomists are puzzled to find in what part of the human body man's superiority consists; and scarcely any but the metaphysician can draw the line that divides them.

But if we compare their internal structure with our own, the likeness will be found still to increase, and we shall perceive many advantages they enjoy in common with us, above the lower tribes of nature. Like us, they are placed above the class of birds, by bringing forth their young alive; like us, they are placed above the class of fishes, by breathing through the lungs; like us, they are placed above the class of insects, by having red blood circulating through their veins; and, lastly, like us, they are different from almost all the other classes of animated nature, being either wholly or partly covered with hair. Thus nearly are we represented, in point of conformation, to the class of animals immediately below us; and this shows what little reason we have to be proud of our persons alone, to the perfection of which quadrupeds make such very near approaches.

The similitude of quadrupeds to man obtains also in the fixedness of their nature, and their being less apt to be changed by the influence of climate or food, than the lower ranks of nature.[1] Birds are found very apt to alter both in colour and size; fishes likewise still more; insects may be quickly brought to change and adapt themselves to the climate; and if we descend to plants, which may be allowed to have a kind of living existence, their kinds may be surprisingly and readily altered, and taught to assume new forms. The figure of every animal may be considered as a kind of drapery, which it may be made to put on or off by human assiduity: in man, the drapery is almost invariable; in quadrupeds, it admits of some variation; and the variety may be made greater still, as we descend to the inferior classes of animal existence.

Quadrupeds, although they are thus strongly marked, and in general divided from the various kinds around them, yet some of them are often of so equivocal a nature, that it is hard to tell whether they ought to be ranked in the quadruped class, or degraded to those below them. If, for instance, we were to marshal the whole groupe of animals round man, placing the most perfect next him, and those most equivocal near the classes they most approach, we should find it difficult, after the principal had taken their stations near him, where to place many that lie at the outskirts of this phalanx. The bat makes a near approach to the aerial tribe, and might, by some, be reckoned among the birds. The porcupine has not less pretensions to that class, being covered with quills, and showing that birds are not the only part of nature that are furnished with such a defence. The armadillo might be referred to the tribe of insects or snails, being like them covered with a shell; the seal and the morse might be ranked among the fishes, like them being furnished with fins and almost constantly residing in the same element. All these, the farther they recede from the human figure, become less perfect, and may be considered as the lowest kinds of that class to which we have referred them.

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[1] Buffon.

But although the variety in quadrupeds is thus great, they all seem well adapted to the stations in which they are placed. There is scarcely one of them, how rudely shaped soever, that is not formed to enjoy a state of happiness fitted to its nature.[2] All its deformities are only relative to us, but all its enjoyments are peculiarly its own. We may superficially suppose the sloth, that takes up months in climbing a single tree, or the mole, whose eyes are too small for distinct vision, are wretched and helpless creatures: but it is probable that their life, with respect to themselves, is a life of luxury; the most pleasing food is easily obtained; and as they are abridged in one pleasure, it may be doubled in those which remain. Quadrupeds, and all the lower kinds of animals, have, at worst, but the torments of immediate evil to encounter, and this is but transient and accidental: man has two sources of calamity, that which he foresees, as well as that which he feels; so that if his reward were to be in this life alone, then, indeed, would he be of all beings most wretched.

The heads of quadrupeds, though differing from each other, are, in general, adapted to their way of living. In some it is sharp, the better to fit the animal for turning up the earth in which its food lies. In some it is long, in order to give a greater room for the olfactory nerves, as in dogs, who are to hunt and find out their prey by the scent. In others, it is short and thick, as in the lion, to increase the strength of the jaw, and to fit it the better for combat. In quadrupeds that feed upon grass, they are enabled to hold down their head to the ground, by a strong tendinous ligament, that runs from the head to the middle of the back. This serves to raise the head, although it has been held to the ground for several hours, without any labour or any assistance from the muscles of the neck.

The teeth of all animals are entirely fitted to the nature of their food. Those of such as live upon flesh differ in every respect from such as live upon vegetables. In the latter, they seem entirely made for gathering and bruising their simple food, being edged before, and fitted for cutting; but broad towards the back of the jaw, and fitted for pounding. In the carnivorous kinds, they are sharp before, and fitted rather for holding than dividing. In the one, the teeth serve as grindstones; in the other, as weapons or defence: in both, however, the surface of those teeth which serve for grinding are unequal: the cavities and risings fitting those of the opposite, so as to tally exactly when the jaws are brought together. These inequalities better serve for comminuting the food; but they become smooth with age; and, for this reason, old animals take a longer time to chew their food than such as are in the vigour of life.

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[2] "In a state of nature no race of animals is unhappy; they are all adapted to the mode of life which God has ordained them to lead; and their chief enjoyment consists in pursuing their natural habits, whatever these may be. The woodpecker, while boring a tree, and clinging to it for hours by its scandent feet, is just as happy as the eagle is when perched upon the mountain-cliff, or pouncing on its quarry from the clouds. Neither could lead the life of the other, but each is happy in the state which has been assigned to it; and this is observable throughout all nature. A rat, which burrows in a ditch, is as happy as it could desire, so long as it can find garbage sufficient to feed on; and a heron, immoveably fixed watching for the approach of small fishes and frogs, has, there can be little doubt, as much pleasure as any lover of the angle can enjoy while wearing out the summer day in marking his light float, and waiting, in mute expectation, the wished-for bite. We generally, I believe, connect rapidity or slowness of motion with the ideas we form of an animal's happiness. If, like the tortoise, it move with slow and measured steps, we pity or despise, as the mood may be, its melancholy, sluggish condition; and the poor persecuted toad has, probably, incurred as much of the odium so unjustly attached to it, by its inactivity, as by the supposed loathsomeness of its appearance. On the other hand, enjoyment seems always to be the concomitant of celerity of motion. A fly, dancing in the air, seems more happy than the spider lurking in his den; and the lark, singing at 'heaven's gate,' to possess a more joyous existence than the snail, which creeps almost imperceptibly upon a leaf, or the mole, which passes the hours of brightness and sunshine in his dark caverns underground. But these and all other animals are happy, each in its own way; and the habits of one, constituted as the creatures are, could form no source of felicity to another, but the very reverse. Though activity may stimulate the appearance of superior enjoyment, we may conceive, that where it is excessive, the animal in which it is so demonstrated must suffer much from fatigue. This would be another mistake, in so far as relates to animals in a state of nature. The works of God are all perfect in their kind; but if an animal were formed to lead a life of almost perpetual motion, and that motion were accompanied or followed by fatigue, the work would be imperfect: take the swallow as an example; it is constantly on the wing except at night. From the early morning to the downgoing of the sun, it is for ever dashing through the air with the rapidity of an arrow, but neither morning nor evening does it ever show one symptom of weariness; it has a wing which never tires; and at night it betakes itself to repose, not worn out by the fatigues of the day, but prepared for sleep after what is to it a wholesome exercise."—*Anon.*

Their legs are not better fitted than their teeth to their respective wants or enjoyments. In some they are made for strength only, and to support a vast unwieldy frame, without much flexibility or beautiful proportion. Thus, the legs of the elephant, the rhinoceros, and the sea-horse, resemble pillars: were they made smaller, they would be unfit to support the body; were they endowed with greater flexibility, or swiftness, that would be needless, as they do not pursue other animals for food; and conscious of their own superior strength, there are none that they deign to avoid. Deer, hares, and other creatures, that are to find safety only in flight, have their legs made entirely for speed; they are slender and nervous. Were it not for this advantage every carnivorous animal would soon make them a prey, and their races would be entirely extinguished. But, in the present state of nature, the means of safety are rather superior to those of offence; and the pursuing animal must owe success only to patience, perseverance, and industry. The feet of some that live upon fish alone, are made for swimming. The toes of these animals are joined together with membranes, being web-footed like a goose or a duck, by which they swim with great rapidity. Those animals that lead a life of hostility, and live upon others, have their feet armed with sharp claws, which some can sheathe, and unsheathe, at will. Those, on the contrary, who lead peaceful lives, have generally hoofs, which serve some as weapons of defence; and which in all are better fitted for traversing extensive tracts of rugged country, than the claw-foot of their pursuers.

The stomach is generally proportioned to the quality of the animal's food, or the ease with which it is obtained. In those that live upon flesh, and such nourishing substances, it is small and glandular, affording such juices as are best adapted to digest its contents; their intestines also are short, and without fatness. On the contrary, such animals as feed entirely upon vegetables have the stomach very large; and those who chew the cud have no less than four stomachs, all which serve as so many laboratories, to prepare and turn their coarse food into proper nourishment. In Africa, where the plants afford greater nourishment than in our temperate climates, several animals, that with us have four stomachs, have there but two.[3] However, in all animals the size of the intestines is proportioned to the nature of the food: where that is furnished in large quantities the stomach dilates to answer the increase. In domestic animals, that are plentifully supplied, it is large; in the wild animals, that live precariously, it is much more contracted, and the intestines are much shorter.

In this manner all animals are fitted by nature to fill up some peculiar station. The greatest animals are made for an inoffensive life, to range the plains and the forest without injuring others; to live upon the productions of the earth, the grass of the field, or the tender branches of trees. These, secure in their own strength, neither fly from any other quadrupeds, nor yet attack them: Nature to the greatest strength has added the most gentle and harmless dispositions; without this those enormous creatures would be more than a match for all the rest of the creation; for what devastation might not ensue, were the elephant, or the rhinoceros, or the buffalo, as fierce and as mischievous as the tiger or the rat! In order to oppose these larger animals, and in some measure to prevent their exuberance, there is a species of the carnivorous kind, of inferior strength indeed, but of greater activity and cunning. The lion and the tiger generally watch for the larger kinds of prey, attack them at some disadvantage, and commonly jump upon them by surprise. None of the carnivorous kinds, except the dog alone, will make a voluntary attack, but with the odds on their side. They are all cowards by nature, and usually catch their prey by a bound from some lurking-place, seldom attempting to invade them openly; for the larger beasts are too powerful for them, and the smaller too swift.

A lion does not willingly attack a horse, and then only when compelled by the keenest hunger. The combats between a lion and a horse are frequent enough in Italy; where they are both enclosed in a kind of amphitheatre, fitted for that purpose. The lion always approaches wheeling about, while the horse presents his hinder parts to the enemy. The lion in this manner goes round and round, still narrowing his circle, till he comes to the proper distance to make his spring; just at the time the lion springs, the horse lashes with both legs from behind, and, in general, the odds are in his favour; it more often happening that the lion is stunned, and struck motionless by the blow, than that he effects his jump between the horse's shoulders. If the lion is stunned, and left sprawling, the horse escapes, without attempting to improve his victory; but if the lion succeeds, he sticks to his prey, and tears the horse in pieces in a very short time.

But it is not among the larger animals of the forest alone, that these hostilities are carried on; there is a minuter, and a still more treacherous contest, between the lower ranks of quadrupeds. The panther hunts for the sheep and the goat; the catamountain for the hare or the rabbit; and the wild cat for the squirrel or the mouse. In proportion as each carnivorous animal wants strength, it uses all the assistance of patience, assiduity, and cunning. However, the arts of these to pursue, are not so great as the tricks of their prey to escape; so that the power of destruction in one class is inferior to the power of safety in the other. Were this otherwise, the forest would soon be dispeopled of the feebler races of animals; and beasts of prey themselves would want, at one time, that subsistence which they lavishly destroyed at another.

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[3] Buffon.

Few wild animals seek their prey in the daytime; they are then generally deterred by their fears of man in the inhabited countries, and by the excessive heat of the sun in those extensive forests that lie toward the south, and in which they reign the undisputed tyrants. As soon as the morning, therefore, appears, the carnivorous animals retire to their dens; and the elephant, the horse, the deer, and all the hare kinds, those inoffensive tenants of the plain, make their appearance. But again, at night-fall, the state of hostility begins; the whole forest then echoes to a variety of different howlings. Nothing can be more terrible than an African landscape at the close of evening: the deep-toned roarings of the lion; the shriller yellings of the tiger; the jackal, pursuing by the scent, and barking like a dog; the hyæna, with a note peculiarly solitary and dreadful; but, above all, the hissing of the various kinds of serpents, that then begin their call, and, as I am assured, make a much louder symphony than the birds in our groves in a morning.

Beasts of prey seldom devour each other; nor can anything but the greatest degree of hunger induce them to it. What they chiefly seek after is the deer or the goat; those harmless creatures, that seem made to embellish nature. These are either pursued or surprised, and afford the most agreeable repast to their destroyers. The most usual method with even the fiercest animals, is to hide and crouch near some path frequented by their prey; or some water where cattle come to drink; and seize them at once with a bound. The lion and the tiger leap twenty feet at a spring; and this, rather than their swiftness or their strength, is what they have most to depend upon for a supply. There is scarcely one of the deer or hare kind that is not very easily capable of escaping them by its swiftness; so that whenever any of these fall a prey, it must be owing to their own inattention.

But there is another class of the carnivorous kind, that hunt by the scent, and which it is much more difficult to escape. It is remarkable, that all animals of this kind pursue in a pack; and encourage each other by their mutual cries. The jackal, the syagush, the wolf, and the dog, are of this kind; they pursue with patience rather than swiftness; their prey flies at first, and leaves them for miles behind; but they keep on with a constant steady pace, and excite each other by a general spirit of industry and emulation, till at last they share the common plunder. But it too often happens, that the larger beasts of prey, when they hear a cry of this kind begin, pursue the pack, and when they have hunted down the animal, come in and monopolize the spoil. This has given rise to the report of the jackal's being the lion's provider; when the reality is, that the jackal hunts for itself, and the lion is an unwelcome intruder upon the fruits of his toil.

Nevertheless, with all the powers which carnivorous animals are possessed of, they generally lead a life of famine and fatigue. Their prey has such a variety of methods for escaping, that they sometimes continue without food for a fortnight together: but nature has endowed them with a degree of patience equal to the severity of their state; so that as their subsistence is precarious, their appetites are complying. They usually seize their prey with a roar, either of seeming delight, or perhaps to terrify it from resistance. They frequently devour it, bones and all, in the most ravenous manner; and then retire to their dens, continuing inactive, till the calls of hunger again excite their courage and industry. But as all their methods of pursuit are counteracted by the arts of evasion, they often continue to range without success, supporting a state of famine for several days, nay, sometimes, weeks together. Of their prey, some find protection in holes, in which nature has directed them to bury themselves; some find safety by swiftness; and such as are possessed of neither of these advantages, generally herd together, and endeavour to repel invasion by united force. The very sheep, which to us seem so defenceless, are by no means so in a state of nature; they are furnished with arms of defence, and a very great degree of swiftness; but they are still further assisted by their spirit of mutual defence: the females fall into the centre; and the males, forming a ring round them, oppose their horns to the assailants. Some animals, that feed upon fruits which are to be found only at one time of the year, fill their holes with several sorts of plants, which enable them to lie concealed during the hard frosts of the winter, contented with their prison, since it affords them plenty and protection. These holes are dug with so much art, that there seems the design of an architect in the formation. There are usually two apertures, by one of which the little inhabitant can always escape, when the enemy is in possession of the other. Many creatures are equally careful of avoiding their enemies, by placing a sentinel to warn them of the approach of danger. These generally perform this duty by turns; and they know how to punish such as have neglected their post, or have been unmindful of the common safety. Such are a part of the efforts that the weaker races of quadrupeds exert to avoid their invaders; and, in general, they are attended with success. The arts of instinct are most commonly found an overmatch for the invasions of instinct. Man is the only creature against whom all their little tricks cannot prevail. Wherever he has spread his dominions, scarcely any flight can save, or any retreat harbour; wherever he comes, terror seems to follow, and all society ceases among the inferior tenants of the plain; their union against him can yield them no protection, and their cunning is but weakness. In their fellow-brutes, they have an enemy whom they can oppose with an equality of advantage; they can oppose fraud or swiftness to force, or numbers to invasion; but what can be done against such an enemy as man, who finds them out though unseen; and though remote, destroys them? Wherever he comes, all the contests among the meaner ranks seem to be at an end, or are carried on only by surprise. Such as he has thought proper to protect, have calmly submitted to his protection; such as he has found it convenient to destroy, carry on an unequal war, and their numbers are every day decreasing.

The wild animal is subject to few alterations; and, in a state of savage nature, continues for ages the same, in size, shape, and colour. But it is otherwise when subdued, and taken under the protection of man; its external form, and even its internal structure, are altered by human assiduity; and this is one of the first and greatest causes of the variety that we see among the several quadrupeds of the same species. Man appears to have changed the very nature of domestic animals, by cultivation and care. A domestic animal is a slave that seems to have few other desires but such as man is willing to allow it. Humble, patient, resigned, and attentive, it fills up the duties of its station; ready for labour, and content with subsistence.

Almost all domestic animals seem to bear the marks of servitude strong upon them. All the varieties in their colour, all the fineness and length of their hair, together with the depending length of their ears, seem to have arisen from a long continuance of domestic slavery.—What an immense variety is there to be found in the ordinary race of dogs and horses! the principal differences of which have been effected by the industry of man, so adapting the food, the treatment, the labour, and the climate, that Nature seems almost to have forgotten her original design; and the tame animal no longer bears any resemblance to its ancestors in the woods around him.

In this manner, nature is under a kind of constraint, in those animals we have taught to live in a state of servitude near us. The savage animals preserve the marks of their first formation; their colours are generally the same; a rough dusky brown, or a tawny, seem almost their only varieties. But it is otherwise in the tame; their colours are various, and their forms different from each other. The nature of the climate indeed operates upon all; but more particularly on these. That nourishment which is prepared by the hand of man, not adapted to their appetites, but to suit his own convenience; that climate, the rigours of which he can soften; and that employment to which they are sometimes assigned; produce a number of distinctions that are not to be found among the savage animals. These, at first, were accidental, but in time became hereditary; and a new race of artificial monsters are propagated, rather to answer the purposes of human pleasure than their own convenience. In short, their very appetites may be changed; and those that feed only upon grass may be rendered carnivorous. I have seen a sheep that would eat flesh, and a horse that was fond of oysters.

But not their appetites, or their figure alone, but their very dispositions, and their natural sagacity, are altered by the vicinity of man. In those countries where men have seldom intruded, some animals have been found, established in a kind of civil state of society. Remote from the tyranny of man, they seem to have a spirit of mutual benevolence, and mutual friendship. The beavers, in those distant solitudes, are known to build like architects, and rule like citizens. The habitations that these have been seen to erect, exceed the houses of the human inhabitants of the same country, both in neatness and convenience. But as soon as man intrudes upon their society, they seem impressed with the terrors of their inferior situation, their spirit of society ceases, the bond is dissolved, and every animal looks for safety in solitude, and there tries all its little industry to shift only for itself.

Next to human influence, the climate seems to have the strongest effects both upon the nature and the form of quadrupeds. As in man we have seen some alterations produced by the variety of his situation; so in the lower ranks, that are more subject to variation, the influence of climate is more readily perceived. As these are more nearly attached to the earth, and in a manner connected to the soil; as they have none of the arts of shielding off the inclemency of the weather, or softening the rigours of the sun, they are consequently more changed by its variations. In general it may be remarked, that the colder the country, the larger and the warmer is the fur of each animal; it being wisely provided by Nature, that the inhabitant should be adapted to the rigours of its situation. Thus the fox and wolf, which in temperate climates have but short hair, have a fine long fur in the frozen regions near the pole. On the contrary, those dogs which with us have long hair, when carried to Guinea or Angola, in a short time cast their thick covering, and assume a lighter dress, and one more adapted to the warmth of the country. The beaver and the ermine, which are found in the greatest plenty in the cold regions, are remarkable for the warmth and delicacy of their furs; while the elephant and the rhinoceros, that are natives of the line, have scarcely any hair. Not but that human industry can, in some measure, co-operate with, or repress, the effects of climate in this particular. It is well known what alterations are produced, by proper care, in the sheep's fleece, in different parts of our country; and the same industry is pursued with a like success in Syria, where many of their animals are clothed with a long and beautiful hair, which they take care to improve, as they work it into that stuff called camlet, so well known in different parts of Europe.

The disposition of the animal seems also not less marked by the climate than the figure. The same causes that seem to have rendered the human inhabitants of the rigorous climates savage and ignorant, have also operated upon their animals. Both at the line and the pole, the wild quadrupeds are fierce and untameable. In these latitudes, their savage dispositions having not been quelled by any efforts from man, and being still farther stimulated by the severity of the weather, they continue fierce and untractable. Most of the attempts which have hitherto been made to tame the wild beasts brought home from the pole or the equator, have proved ineffectual. They are gentle and harmless enough while young; but as they grow up, they acquire their natural ferocity, and snap at the hand that feeds them. It may indeed, in general, be asserted, that in all countries where the men are most barbarous, the beasts are most fierce and cruel; and this is but a natural consequence of the struggle between man and the more savage animals of the forest; for in proportion as he is weak and timid, they must be bold and intrusive; in proportion as his dominion is but feebly supported, their rapacity must be more obnoxious. In the extensive countries, therefore, lying round the pole, or beneath the line, the quadrupeds are fierce and formidable. Africa has ever been remarked for the brutality of its men, and the fierceness of its animals: its lions and its leopards are not less terrible than its crocodiles and its serpents; their dispositions seem entirely marked with the rigours of the climate, and being bred in an extreme of heat, they show a peculiar ferocity, that neither the force of man can conquer, nor his arts allay. However, it is happy for the wretched inhabitants of those climates, that its most formidable animals are all solitary ones; that they have not learned the art of uniting, to oppress mankind; but each depending on its own strength, invades without any assistant.

The food also is another cause of the variety which we find among quadrupeds of the same kind. Thus the beasts which feed in the valley are generally larger than those which glean a scanty subsistence on the mountain. Such as live in the warm climates, where the plants are much larger and more succulent than with us, are equally remarkable for their bulk. The ox fed on the plains of Indostan, is much larger than that which is more hardily maintained on the side of the Alps. The deserts of Africa, where the plants are extremely nourishing, produce the largest and fiercest animals; and, perhaps for a contrary reason, America is found not to produce such large animals as are seen in the ancient continent. But, whatever be the reason, the fact is certain, that while America exceeds us in the size of its reptiles of all kinds, it is far inferior in its quadruped productions. Thus, for instance, the largest animal of that country is the tapir, which can by no means be compared to the elephant of Africa. Its beasts of prey, also, are divested of that strength and courage which is so dangerous in this part of the world. The American lion, tiger, and leopard, if such diminutive creatures deserve these names, are neither so fierce nor so valiant as those of Africa and Asia. The tiger of Bengal has been seen to measure twelve feet in length, without including the tail: whereas the American tiger seldom exceeds three. This difference obtains still more in the other animals of that country, so that some have been of opinion[4] that all quadrupeds in South America are of a different species from those most resembling them in the old world; and that there are none which are common to both, but such as have entered America by the north; and which, being able to bear the rigours of the frozen pole, have travelled from the ancient continent, by that passage, into the new. Thus the bear, the wolf, the elk, the stag, the fox, and the beaver, are known to the inhabitants as well of North America as of Russia; while most of the various kinds to the southward, in both continents, bear no resemblance to each other. Upon the whole, such as peculiarly belong to the new continent are without any marks of the quadruped perfection. They are almost wholly destitute of the power of defence; they have neither formidable teeth, horns, nor tail; their figure is awkward, and their limbs ill proportioned. Some among them, such as the ant-bear and the sloth, appear so miserably deformed, as scarcely to have the power of moving and eating. They seemingly drag out a miserable and languid existence in the most desert solitude; and would quickly have been destroyed in a country where there were inhabitants, or powerful beasts to oppose them.

But if the quadrupeds of the new continent be less, they are found in much greater abundance; for it is a rule that obtains through nature, that the smallest animals multiply the fastest. The goat, imported from Europe to South America, soon begins to degenerate; but as it grows less it becomes more prolific; and, instead of one kid at a time, or two at the most, it generally produces five, and sometimes more. What there is in the food, or the climate, that produces this change, we have not been able to learn; we might be apt to ascribe it to the heat, but that on the African coast, where it is still hotter, this rule does not obtain; for the goat, instead of degenerating there, seems rather to improve.

However, the rule is general among all quadrupeds, that those which are large and formidable produce but few at a time; while such as are mean and contemptible are extremely prolific. The lion, or tiger, have seldom above two cubs at a litter; while the cat, that is of a similar nature, is usually seen to have five or six. In this manner the lower tribes become extremely numerous; and, but for this surprising fecundity, from their natural weakness they would quickly be extirpated. The breed of mice, for instance, would have long since been blotted from the earth, were the mouse as slow in production as the elephant. But it has been wisely provided, that such animals as can make but little resistance, should at least have a means of repairing the destruction, which they must often suffer, by their quick reproduction; that they should increase even among enemies, and multiply under the hand of the destroyer. On the other hand, it has as wisely been ordered by Providence, that the larger kinds should produce but slowly; otherwise, as they require proportional supplies from nature, they would quickly consume their own store; and, of consequence, many of them would soon perish through want; so that life would thus be given without the necessary means of subsistence. In a word, Providence has most wisely balanced the strength of the great against the weakness of the little. Since it was necessary that some should be great and others mean, since it was expedient that some should live upon others, it has assisted the weakness of one by granting it fruitfulness; and diminished the number of the other by infecundity.

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[4] Buffon.

In consequence of this provision, the larger creatures, which bring forth few at a time, seldom begin to generate till they have nearly acquired their full growth. On the contrary, those which bring many, reproduce before they have arrived at half their natural size. Thus the horse and the bull are nearly at their best before they begin to breed; the hog and the rabbit scarcely leave the teat before they become parents in turn. Almost all animals likewise continue the time of their pregnancy in proportion to their size. The mare continues eleven months with foal, the cow nine, the wolf five, and the bitch nine weeks. In all, the intermediate litters are the most fruitful; the first and the last generally producing the fewest in number, and the worst of the kind.[5]

Whatever be the natural disposition of animals at other times, they all acquire new courage when they consider themselves as defending their young. No terrors can then drive them from the post of duty; the mildest begin to exert their little force, and resist the most formidable enemy. Where resistance is hopeless, they then incur every danger, in order to rescue their young by flight, and retard their own expedition by providing for their little ones. When the female

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[5] PERIODS OF REPRODUCTION IN DIFFERENT ANIMALS.

Kinds of Animals.	Proper Age for Reproduction.	Period of the Power of Reproduction.	Number of Females for one Male.	Period of Gestation and Incubation.		
				Shortest Period.	Mean Period.	Longest Period.
	Years.	Years.		Days.	Days.	Days.
Mare	4	10 to 12	...	322	347	419
Stallion	5	12 to 15	20 to 30			
Cow	3	10	...	240	283	321
Bull	3	5	30 to 40			
Ewe	2	6	..	146	154	161
Tup	2	7	40 to 50			
Sow	1	6	...	109	115	143
Boar	1	6	6 to 10			
She-Goat	2	6	...	150	156	163
He-Goat	2	5	20 to 40			
She-Ass	4	10 to 12	...	365	380	391
He-Ass	5	12 to 15				
She-Buffalo	...	...	...	281	308	335
Bitch	2	8 to 9	...	55	60	63
Dog	2	8 to 9				
She-Cat	1	5 to 6	...	48	50	56
He-Cat	1	9 to 10	5 to 6			
Doe-Rabbit	6 mo.	5 to 6	...	20	28	35
Buck-Rabbit	6 ,,	5 to 6	30			
Cock	6 ,,	5 to 6	12 to 15			
Turkey, sitting on the eggs of the Hen	...	...	...	17	24	28
Duck	...	...	...	24	27	30
Turkey	...	...	...	24	26	30
Hen, sitting on the eggs of the Duck	...	...	...	26	30	34
Hen	...	3 to 5	...	19	21	24
Duck	...	...	...	28	30	32
Goose	...	...	...	27	30	33
Pigeon	...	...	...	16	18	20

oppossum, an animal of America, is pursued, she instantly takes her young into a false belly, with which nature has supplied her, and carries them off, or dies in the endeavour. I have been lately assured of a she-fox, which, when hunted, took her cub in her mouth, and run for several miles without quitting it until at last she was forced to leave it behind, upon the approach of a mastiff, as she ran through a farmer's yard. But, if at this period the mildest animals acquire new fierceness, how formidable must those be that subsist by rapine! At such times, no obstacles can stop their ravage, nor no threats can terrify; the lioness then seems more hardy than even the lion himself. She attacks men and beasts indiscriminately, and carries all she can overcome reeking to her cubs, whom she thus early accustoms to slaughter. Milk, in the carnivorous animals, is much more sparing than in others; and it may be for this reason that all such carry home their prey alive, that, in feeding their young, its blood may supply the deficiencies of nature, and serve instead of that milk with which they are so sparingly supplied.

Nature, that has thus given them courage to defend their young, has given them instinct to choose the proper times of copulation, so as to bring forth when the provision suited to each kind is to be found in the greatest plenty. The wolf, for instance, couples in November, so that the time of pregnancy continuing five months, it may have its young in April. The mare, who goes eleven months, admits the horse in summer, in order to foal about the beginning of May. On the contrary, those animals which lay up provisions for the winter, such as the beaver and the marmotte, couple in the latter end of autumn, so as to have their young about January, against which season they have provided a very comfortable store. These seasons for coupling, however, among some of the domestic kinds, are generally in consequence of the quantity of provisions with which they are at any time supplied. Thus we may, by feeding any of these animals, and keeping off the rigour of the climate, make them breed whenever we please. In this manner those contrive who produce lambs all the year round.

The choice of situation in bringing forth is also very remarkable. In most of the rapacious kinds, the female takes the utmost precautions to hide the place of her retreat from the male; who otherwise, when pressed by hunger, would be apt to devour her cubs. She seldom, therefore, strays far from the den, and never approaches it while he is in view, nor visits him again till her young are capable of providing for themselves. Such animals as are of tender constitutions take the utmost care to provide a place of warmth, as well as safety, for their young; the rapacious kinds bring forth in the thickest woods; those that chew the cud, with the various tribes of the vermin kind, choose some hiding place in the neighbourhood of man. Some dig holes in the ground; some choose the hollow of a tree; and all the amphibious kinds bring up their young near the water, and accustom them betimes to their proper element.

Thus Nature seems kindly careful for the protection of the meanest of her creatures; but there is one class of quadrupeds that seems entirely left to chance, that no parent stands forth to protect, nor no instructor leads, to teach the arts of subsistence. These are the quadrupeds that are brought forth from the egg, such as the lizard, the tortoise, and the crocodile. The fecundity of all other animals compared with these is sterility itself. These bring forth above two hundred at a time; but, as the offspring is more numerous, the parental care is less exerted. Thus the numerous brood of eggs are, without farther solicitude, buried in the warm sands of the shore, and the heat of the sun alone is left to bring them to perfection. To this perfection they arrive almost as soon as disengaged from the shell. Most of them, without any other guide than instinct, immediately make to the water. In their passage thither, they have numberless enemies to fear. The birds of prey that haunt the shore, the beasts that accidentally come there, and even the animals that give them birth, are known, with a strange rapacity, to thin their numbers as well as the rest.

But it is kindly ordered by Providence, that these animals which are mostly noxious, should thus have many destroyers; were it not for this, by their extreme fecundity, they would soon overrun the earth, and cumber all our plains with deformity.

BOOK II.

ANIMALS OF THE HORSE KIND.[1]

CHAP. I.

OF THE HORSE.[2]

ANIMALS of the horse kind deserve a place next to man, in a history of nature. Their activity, their strength, their usefulness, and their beauty, all contribute to render them the principal objects of our curiosity and care; a race of creatures in whose welfare we are interested next to our own.

Of all the quadruped animals the horse seems the most beautiful, the noble largeness of his form, the glossy smoothness of his skin, the graceful ease of his motions, and the exact symmetry of his shape, have taught us to regard him as the first, and as the most perfectly formed; and yet, what is extraordinary enough, if we examine him internally, his structure will be found the most different from that of man of all other quadrupeds whatsoever. As the ape approaches us the nearest in internal conformation, so the horse is the most remote;[3] a striking proof that there may be oppositions of beauty, and that all grace is not to be referred to one standard.

To have an idea of this noble animal in his native simplicity, we are not to look for him in the pastures or the stables to which he has been consigned by man; but in those wild and extensive plains where he has been originally produced; where he ranges without control, and riots in all the variety of luxurious nature. In this state of happy independence, he disdains the assistance of man, which only tends to servitude. In those boundless tracts, whether of Africa or New Spain, where he runs at liberty, he seems no way incommoded with the inconveniences to which he is subject in Europe. The continual verdure of the fields supplies his wants; and the climate, that never knows a winter, suits his constitution, which naturally seems adapted to heat. His enemies of the forest are but few, for none but the greater kinds will venture to attack him; any one of these he is singly able to overcome; while, at the same time, he is content to find safety in society; for the wild horses of those countries always herd together.

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[1] The genus equus, or horse, contains six species, agreeing in their essential characters, which are thus defined by Cuvier in his 'Regne Animal:' Incisory teeth, six in the upper jaw, and six in the under; two canines, one above and one below, on each side of the cutting or incisory teeth, (the females of some of the species with no canine teeth,) and six cheek teeth, or grinders, on each side, on both jaws; they are furrowed on both sides with flat crowns and several ridges of enamel. Between the canines and cheek teeth is a void space; the upper lip is susceptible of considerable motion; the eyes are large; the pupil oblong-ovate, placed laterally; their sight excellent, and although not formed for seeing in the night, they can distinguish objects very clearly in the dark: ears rather small, pointed, and erect, having great mobility in the external conch, so that their hearing is very acute, and is the sense which, in all probability, they possess in the greatest perfection; feet, with a single apparent toe, covered with a thick hoof; the tail is furnished with long hair, or with a tuft at the extremity; mammæ two, inguinal; the stomach is simple and membranaceous, and the intestines and cæcum very large. This genus forms a very natural, though isolated, division in the class mammalia. Its characters are so distinct, that it cannot be grouped with any other genus. This is strongly exemplified by the different places the genus has occupied in the arrangements of authors; to none of which it had the slightest alliance. In the Linnæan arrangement, it is placed with the hippopotamus, as a genus of the order belluæ. The method of Erxleben, ranks it between the elephant and dromedary. Storr made a distinct order of it, to follow the ruminantia, under the name solipedes, which was followed by Baron Cuvier in his first edition of the 'Regne Animal.' It has been subsequently placed by Cuvier in the ninth genus of his sixth order, called pachydermata. The following are the great French naturalist's characteristics of this order:—Skin very thick, whence the name of the order; some of the genera are partially without teeth, others with the three sorts of teeth; quadrupedal, generally with hoofs, and the toes varying in number; stomach simple, and they do not ruminate; without clavicles, or collar-bones. They are either herbivorous or omniverous, and their habits are various. They generally inhabit the temperate and torrid zones.

The species of this genus are six: namely, the horse, ass, common zebra, the zebra of the plains, the quagga, the dziggtai, with the mule, which may be regarded as a sub-species. It is not possible to determine whether the fossil bones of horses, which are found, in strata, associated with the bones of other extinct species of animals, are really of a distinct species from any that at present exist; but, judging from analogy, we are warranted in supposing them to be so. There is so little difference in the bones of this genus, that the most skilful osteologists are unable, from them, to determine the species, which they can distinguish with ease and certainty in almost every other animal.—ED.

[2] As it may happen, that, in a description where it is the aim rather to insert what is not usually known, than all that is known, some of the more obvious particulars may be omitted; I will take leave to subjoin in the notes the characteristic marks of each animal, as given us by Linnæus. "The horse, with six cutting teeth before, and single hoofed; a native of Europe and the East (but I rather believe of Africa); a generous, proud, and strong animal; fit either for the draught, the course, or the road; he is delighted with woods; he takes care of his hinder parts; defends himself from the flies with his tail; scratches his fellow; defends his young; calls by neighing; sleeps after night-fall; fights by kicking, and by biting also; rolls on the ground when he sweats; eats the grass closer than the ox; distributes the seed by dunging; wants a gall bladder; never vomits; the foal is produced with the feet stretched out; he is injured by being struck on the ear; upon the stiffle; by being caught by the nose in barnacles; by having his teeth rubbed with tallow; by the herb padus; by the herb phalandria; by the cruculio; by the conops. His diseases are different in different countries. A consumption of the ethmoid bones of the nose, called the *glanders*, is with us the most infectious and fatal. He eats hemlock without injury. The mare goes with foal 290 days. The placenta is not fixed. He acquires not the canine teeth till the age of five years."—*Note by Goldsmith.*

[3] Histoire Naturelle, Daubenton, vol. vii. p. 374.

In these countries, therefore, the horses are often seen feeding in droves of five or six hundred. As they do not carry on war against any other race of animals, they are satisfied to remain entirely upon the defensive. The pastures on which they live satisfy all their appetites, and all other precautions are purely for their security, in case of a surprise. As they are never attacked but at a disadvantage, whenever they sleep in the forests, they have always one among their number that stands as sentinel, to give notice of any approaching danger; and this office they take by turns.[4] If a man approaches them while they are feeding by day, their sentinel walks up boldly near him, as if to examine his strength, or to intimidate him from proceeding; but as the man approaches within pistol-shot, the sentinel then thinks it high time to alarm his fellows; this he does by a loud kind of snorting, upon which they all take the signal and fly off with the speed of the wind; their faithful sentinel bringing up the rear.[5]

It is not easy to say from what country the horse came originally.[6] It should seem that the colder climates do not agree with his constitution; for although he is found almost in them all, yet his form is altered there, and he is found at once diminutive and ill-shaped. We have the testimony of the ancients that there were wild horses once in Europe; at present, however, they are totally brought under subjection; and even those which are found in America are of a Spanish breed, which being sent thither upon its first discovery, have since become wild, and have spread over all the south of that vast continent almost to the straits of Magellan. These, in general, are a small breed, of about fourteen hands high. They have thick jaws and clumsy joints; their ears and neck also are long; they are easily tamed; for the horse, by nature, is a gentle complying creature, and resists rather from fear than obstinacy. They are caught by a kind of noose, and then held fast by the legs, and tied to a tree, where they are left for two days without food or drink. By that time they begin to grow manageable; and in some weeks they become as tame as if they had never been in a state of wildness. If, by any accident, they are once more set at liberty, they never become wild again, but know their masters, and come to their call. Some of the buccaniers have often been agreeably surprised, after a long absence, to see their faithful horses once more present themselves, with their usual assiduity; and come up, with fond submission, to receive the rein.

These American horses, however, cannot properly be ranked among the wild races, since they were originally bred from such as were tame.[7] It is not in the new, but the old world, that we are to look for this animal, in a true state of nature; in the extensive deserts of Africa, in Arabia, and those wide-spread countries that separate Tartary from the more southern nations. Vast droves of these animals are seen wild among the Tartars; they are of a small breed, extremely swift, and very readily evade their pursuers. As they go together, they will not admit of any strange animals among them, though even of their own kind. Whenever they find a tame horse attempting to associate with them, they instantly gather round him, and soon oblige him to seek safety by flight. There are vast numbers also of wild horses to the north of China, but they are of a weak, timid breed, small of stature, and useless in war.

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[4] Dictionnaire Universelle des Animaux, p. 19.

[5] Labat, tom. vii.

[6] See Supplementary Note A, p. 277.

[7] The wild horses which exist in the extensive plains of South America, extending from the shores of La Plata to Patagonia, are descendants of those carried thither by the Spaniards after their discovery of the country, and have increased with such astonishing rapidity that they are to be seen in troops of many thousands. Azara affirms that they sometimes congregate in squadrons of not less than ten thousand individuals. They are invariably preceded by a leader, by whom they are governed, and who appears to direct all their movements, which are performed in a manner so perfectly systematic as hardly to be surpassed in regularity by the best-trained cavalry. It is extremely dangerous for travellers to pass through the districts in which these horses abound; for, if perceived by the wild herd, they will approach closely to those who are mounted on horseback. After their leader and videttes, or advanced guard, have reconnoitered the strangers, they will, at the direction of the leader, make a rapid wheel round the course of the travellers, and, with a loud and irritating neighing, tempt the tame horses; which are either saddled or loaded, to join them; whereupon, if the rider do not use all his energies, or the leader of the loaded horse his utmost care, they will either fling the rider, or throw-off their burden, and precipitately unite with the wild troop, after which they are lost for ever. The steady approach and menacing appearance of this prodigious column of horses is most appalling to those who witness it for the first time; the trampling sound of the animals' hoofs, even upon the green sward, may be compared to the loudest thunder, while it makes all around to vibrate. In this manner they will frequently sweep round the astonished traveller, like the whirlwind of the desert, threatening instant destruction; when of a sudden they will wheel in an opposite course, and disappear in the neighbouring wilderness. These immense troops do not always feed together, but disperse into smaller herds, when the cause of alarm which congregated them has passed away. The wild horses of America are generally chestnut, bay, sorrel, or black colour. The latter, however, is not very common, and chestnut usually predominates, from which some authors suppose that to be the original hue of the horse; but we do not find it to be the prevailing colour of the Asiatic wild breeds, bay-dun being the most common among these. The general pace of the American horse is between a gallop and an amble.—Ed.

At the Cape of Good Hope there are numbers of horses in a state of nature, but small, vicious, and untameable. They are found wild also in several other parts of Africa; but the wretched inhabitants of that country either want the art to tame them, or seem ignorant of their uses. It is common with the negroes, who are carried over from thence to America, when they first see a horse, to testify both terror and surprise. These poor men seem not to have any knowledge of such a creature; and, though the horse is probably a native of their own country, they have let all the rest of mankind enjoy the benefit of his services without turning them to any advantage at home. In some parts of Africa, therefore, where the horse runs wild, the natives seem to consider him rather in the light of a dainty for food, than a useful creature, capable of assisting them either in war or in labour: riding seems a refinement that the natives of Angola or Caffraria have not as yet been able to attain to; and whenever they catch a horse, it is only with an intent to eat him.

But of all countries in the world, where the horse runs wild, Arabia produces the most beautiful breed, the most generous, swift, and persevering. They are found, though not in great numbers, in the deserts of that country; and the natives use every stratagem to take them. Although they are active and beautiful, yet they are not so large as those that are bred up tame; they are of a brown colour, their mane and tail very short, and the hair black and tufted.[8] Their swiftness is incredible; the attempt to pursue them in the usual manner of the chase, with dogs, would be entirely fruitless. Such is the rapidity of their flight, that they are instantly out of view, and the dogs themselves give up the vain pursuit. The only method, therefore, of taking them is by traps hidden in the sand, which entangling their feet, the hunter at length comes up, and either kills them, or carries them home alive. If the horse be young, he is considered among the Arabians as a very great delicacy; and they feast upon him while any part is found remaining: but if, from his shape or vigour, he promises to be serviceable in his more noble capacity, they take the usual methods of taming him, by fatigue and hunger, and he soon becomes a useful domestic animal.

The usual manner of trying their swiftness is by hunting the ostrich: the horse is the only animal whose speed is comparable to that of this creature, which is found in the sandy plains, with which those countries abound. The instant the ostrich perceives itself aimed at, it makes to the mountains, while the horseman pursues with all the swiftness possible, and endeavours to cut off its retreat. The chase then continues along the plain, while the ostrich makes use of both legs and wings to assist its motion. However, a horse of the first speed is able to outrun it; so that the poor animal is then obliged to have recourse to art, to elude the hunter, by frequently turning: at length, finding all escape hopeless, it hides its head wherever it can, and suffers itself tamely to be taken. If the horse, in a trial of this kind, shows great speed, and is not readily tired, his price becomes proportionably great, and there are some horses valued at a thousand ducats.

But the horses thus caught, or trained in this manner, are at present but very few; the value of Arabian horses all over the world, has in a great measure thinned the deserts of the wild breed; and there are very few to be found in those countries except such as are tame. The Arabians, as we are told by historians, first began the management of horses in the time of Sheque Ishmael. Before that, they wandered wild along the face of the country neglected and useless; but the natives then first began to tame their fierceness, and to improve their beauty; so that at present they possess a race of the most beautiful horses in the world, with which they drive a trade, and furnish the stables of princes at immense prices.

There is scarcely an Arabian, how poor soever, but is provided with his horse.[9] They, in general, make use of mares in their ordinary excursions; experience having taught them that they support fatigue, thirst, and hunger, better than the horses are found to do. They are also less vicious, of a gentler nature, and are not so apt to neigh. They are more harmless also among themselves, not so apt to kick or hurt each other, but remain whole days together without the least mischief. The Turks, on the contrary, are not fond of mares; and the Arabians sell them such horses as they do not choose to keep for stallions at home. They preserve the pedigree of their horses with great care, and for several ages back. They know their alliances, and all their genealogy; they distinguish the races by different names, and divide them into three classes. The first is that of the nobles, the ancient breed and unadulterated on either side; the second is that of the horses of the ancient race, but adulterated; and the third is that of the common and inferior kind: the last they sell at a low price; but those of the first class, and even of the second, amongst which are found horses of equal value to the former, are sold extremely dear. They know, by long experience, the race of a horse by his appearance; they can tell the name, the surname, the colour, and the marks properly belonging to each. When they are not possessed of stallions of the noble race themselves, for their mares, they borrow from their neighbours, paying a proper price, as with us, and receive a written attestation of the whole. In this attestation is contained the name of the horse and the mare, and their respective genealogies. When the mare has produced her foal, new witnesses are called, and a new attestation signed, in which are described the marks of the foal, and the day noted when it was brought forth. These attestations increase the value of the horse; and they are given to the person who buys him. The most ordinary mare of this race sells for five hundred crowns; there are many that sell for a thousand; and some of the very finest kinds for fourteen or fifteen hundred pounds. As the Arabians have no other house but a tent to live in, this also serves them for a stable; so that the mare, the foal, the husband, the wife, and the children, lie all together indiscriminately; the little children are often seen upon the body or the neck of the mare, while these continue inoffensive and harmless, permitting them thus to play with and caress them without any injury. The Arabians never beat their horses: they treat them gently; they speak to them, and seem to hold a discourse; they use them as friends; they never attempt to increase their speed by the whip, nor spur them, but in cases of necessity. However, when this happens, they set off with amazing swiftness; they leap over obstacles with as much agility as a buck; and if the rider happens to fall, they are so manageable that they stand still in the midst of their most rapid career. The Arabian horses are of a middle size, easy in their motions, and rather inclined to leanness than fat. They are regularly dressed every morning and evening, and with such care that the smallest roughness is not left upon their skins. They wash the legs, the mane, and the tail, which they never cut; and which they seldom comb, lest they should thin the hair. They give them nothing to eat during the day; they only give them to drink once or twice; and at sunset they hang a bag to their heads in which there is about half a bushel of clean barley. They continue eating the whole night, and the bag is again taken away the next morning. They are turned out to pasture in the beginning of March, when the grass is pretty high, and at which time the mares are given to the stallion. When the spring is past, they take them again from pasture, and they get neither grass nor hay during the rest of the year; barley is their only food, except now and then a little straw. The mane of the foal is clipped when about a year or eighteen months old, in order to make it stronger and thicker. They begin to break them at two years old, or two years and a half at farthest; they never saddle or bridle them till at that age; and then they are always kept ready saddled at the door of the tent, from morning to sunset, in order to be prepared against any surprise. They at present seem sensible of the great advantage their horses are to the country; there is a law, therefore, that prohibits the exportation of the mares; and such stallions as are brought into England are generally purchased on the eastern shores of Africa, and come round to us by the Cape of Good Hope. They are in general less in stature than our own, being not above fourteen, or fourteen hands and a half high; their motions are much more graceful and swifter than that of our own horses; but nevertheless, their speed is far from being equal; they run higher from the ground; their stroke is not so long and close; and they are far inferior in bottom. Still, however, they must be considered as the first and finest breed in the world, and that from which all others have derived their principal qualifications. It is even probable that Arabia is the original country of horses; since there, instead of crossing the breed, they take every precaution to keep it entire. In other countries they must continually change the races, or their horses would soon degenerate; but there the same blood has passed down through a long succession, without any diminution either of force or beauty.[10]

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[8] Marm. Descript. de l'Afrique, lib. i. p. 51.

[9] Buffon.

The race of Arabian horses has spread itself into Barbary among the Moors, and has even extended across that extensive continent to the western shores of Africa. Among the negroes of Gambia and Senegal, the chiefs of the country are possessed of horses, which, though little, are very beautiful, and extremely manageable. Instead of barley, they are fed in those countries with maize bruised and reduced into meal, and mixed up with milk when they design to fatten them. These are considered as next to Arabian horses, both for swiftness and beauty; but they are still rather smaller than the former. The Italians have a peculiar sport, in which horses of this breed run against each other. They have no riders, but saddles so formed as to flap against the horses' sides as they move, and thus to spur them forward. They are set to run in a kind of railed walk, about a mile long, out of which they never attempt to escape; but when they once set forward, they never stop, although the walk from one end to the other is covered with a crowd of spectators, which opens and gives way as the horses approach.[11] Our horses would scarcely, in this manner, face a crowd, and continue their speed without a rider, through the midst of a multitude; and indeed it is a little surprising how in such a place the horses find their own way. However, what our English horses may want in sagacity, they make up by their swiftness; and it has been found upon computation, that their speed is nearly one-fourth greater, even carrying a rider, than that of the swiftest Barb without one.

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[10] "A real Arab steed is worth from three to five hundred pounds. The mares only are prized, and these must neither bite nor kick, or they are deemed vicious; indeed, they are so free from vice, that it is common to see the Bedouin children playing under their bellies. When an Arab sells his mare, he rarely sells all his property in her; he disposes of what he calls a third or fourth, which is merely a reservation of the second or third foal for himself or his family. Their genealogy must be proved at Mecca, for one race only is valued, which is that of the Prophet's favourite mare. Mahomet, it is said, prized this animal for refusing to drink after a long journey in the desert, when he called his stud from the well, and this mare was the only one to leave the water. It is so difficult to get a thorough-bred Arab mare to send out of the country, that I doubt if any ever go to England."—*Madden's Travels.*

The Arabian breed has been diffused into Egypt as well as Barbary, and into Persia also; where, as we are told by Marcus Paulus, there are studs of ten thousand white mares all together, very fleet, and with the hoof so hard that shoeing is unnecessary.[12] In these countries, they in general give their horses the same treatment that they give in Arabia, except that they litter them upon a bed of their own dung, dried in the sun, and then reduced to powder. When this, which is spread under the horse about five inches thick, is moistened, they dry it again, and spread it as before. The horses of these countries a good deal resemble each other. They are usually of a slender make; their legs fine, bony, and far apart; a thin mane; a fine crest; a beautiful head; the ear small and well pointed; the shoulder thin; the side rounded, without any unsightly prominence; the croup is a little of the longest, and the tail is generally set high. The race of horses, however, is much degenerated in Numidia; the natives having been discouraged from keeping the breed up by the Turks, who seize upon all the good horses, without paying the owners the smallest gratuity for their care in bringing them up. The Tingitanians and Egyptians have now, therefore, the fame of rearing the finest horses, both for size and beauty. The smallest of these last are usually sixteen hands high; and all of them shaped, as they express it, with the elegance of an antelope.

Next to the Barb, travellers generally rank the Spanish genette. These horses, like the former, are little, but extremely swift and beautiful. The head is something of the largest; the mane thick; the ears long, but well pointed; the eyes filled with fire; the shoulder thickish, and the breast full and large. The croup round and large; the legs beautiful, and without hair; the pastern a little of the longest, as in the Barb, and the hoof rather too high. Nevertheless, they move with great ease, and carry themselves extremely well. Their most usual colour is black, or a dark bay. They seldom or never have white legs, or white snip. The Spaniards, who have a groundless aversion to these marks, never breed from such as have them. They are all branded on the buttock with the owner's name; and those of the province of Andalusia pass for the best. These are said to possess courage, obedience, grace, and spirit, in a greater degree than even the Barb; and for this reason they have been preferred as war-horses to those of any other country.

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[11] A Roman horse-race is a very different thing from an English one. Instead of a contest in which the skill and boldness of man are as much to be admired as the speed and vigour of the animal he rides, the Roman course presents nothing but the horse, which runs without any rider. The Barbs when brought to the starting-post, are gaily ornamented in front of the head, and sometimes down the neck, with plumes of peacock and other feathers. To a girth which goes round the body of each are attached several loose straps, which have at their end small balls of lead from which issue sharp steel points,—the motion imparted to these straps by the animals' running keeps up a continual spurring on their flanks and bellies. Sheets of thin tin, stiff paper, or some other substance that will make a rustling noise when agitated, are also fastened on the horses' backs. The last-mentioned articles serve to startle and alarm them, as if the prickly leaden balls were not excitement enough. A very strong rope secured by a machine on each side, is drawn across the street of the Corso, and up to this each man tries to bring his horse, holding it in, with all his might, by the head. When matters are ready, a troop of dragoons set off from the other end of the Corso, at full gallop towards the starting-post, clearing the way: these soldiers then retire, and soon after an officer blows a trumpet from a balcony erected near to the spot whence the race is to begin. At the sound of the trumpet the strong rope stretched across the street drops, the grooms let go their hold, and off start the horses like arrows from a bow. The harder they run the more they are pricked. Some of them have been known to be so wise as to stop, when the motion of the leaden balls, of course, would cease; but generally they run on at mad career, and occasionally show emulation and spite, by catching and biting at each other.—*Abridged from the Penny Magazine.*

[12] Persia, from the remotest ages, has been famous for its horses; and at the present day they are excelled only by the Arabian breed. The former were, however, in high estimation long before the latter existed. They were the best cavalry in ancient times, amongst all the eastern nations. We are informed by historians that Alexander the Great considered a Persian horse as a gift of the highest value; it was one which he only bestowed on potentates, and favourites of the first class. Sir John Malcolm says,—"A variety of horses are produced in Persia. The inhabitants of the districts which border on the Gulf, still preserve pure those races of animals, which their ancestors brought from the opposite shore of Arabia. In Fars and Irak, they have a mixed breed from the Arabian, which, though stronger, is still a small horse, compared with either the Toorkoman or Khorassan breed, which are most prized by the soldiers of Persia. Both these latter races have also a great proportion of Arabian blood. The price of horses in Persia varies extremely. The common horse is always to be purchased for from fifteen to forty pounds; fine horses, particularly of the Toorkoman or Khorassan breed, are, in general, very dear; a hundred pounds is a common price, and sometimes a much larger sum is paid. They are often valued more from their breed than their appearance." In some points the Persian horse excels the Arabian. The head is nearly as beautiful, the crupper superior, and the whole frame more developed: the neck is beautifully arched; and the animal possesses much fire. They are about equal in speed; but the Arabian is capable of longer endurance.—Ed.

The Italian horses were once more beautiful than they are at present, for they have greatly neglected the breed. Nevertheless, there are still found some beautiful horses among them, particularly among the Neapolitans, who chiefly use them for the draught. In general, they have large heads and thick necks. They are also restive, and consequently unmanageable. These faults, however, are recompensed by the largeness of their size, by their spirit, and the beauty of their motion. They are excellent for show, and have a peculiar aptitude to prance.

The Danish horses are of such an excellent size, and so strong a make, that they are preferred to all others for the draught. There are some of them perfectly well-shaped; but this is but seldom seen, for in general they are found to have a thick neck, heavy shoulders, long and hollow back, and a narrow croup: however, they all move well, and are found excellent both for parade and war. They are of all colours, and often of whimsical ones, some being streaked like the tiger, or mottled like the leopard.

The German horses are originally from Arabian and Barbary stocks: nevertheless, they appear to be small and ill-shaped: it is said also, that they are weak and washy, with tender hoofs. The Hungarian horses, on the other hand, are excellent for the draught, as well as the saddle. The hussars, who use them in war, usually slit their nostrils; which is done, as it is said, to prevent their neighing, but, perhaps, without any real foundation.

The Dutch breed is good for the draught, and is generally used for that purpose over Europe: the best come from the province of Friezland. The Flanders horses are much inferior to the former; they have most commonly large heads, flat feet, and swollen legs; which are an essential blemish in horses of this kind.

The French horses are of various kinds; but they have few that are good. The best horses of that country come from Limosin; they have a strong resemblance to the Barb, and, like them, they are excellent for the chase; but they are slow in coming to perfection; they are to be carefully treated while young, and must not be backed till they are eight years old. Normandy furnishes the next best; which, though not so good for the chase, are yet better for war. In general, the French horses have the fault of being heavy-shouldered, which is opposite to the fault of the Barb, which is too thin in the shoulder, and is consequently apt to be shoulder-slipped.[13]

Having mentioned the horses most usually known in Europe, we pass on to those of more distant countries, of whose horses we can only judge by report. We mentioned the wild horses of America. Such as are tame, if we may credit the latest reports,[14] are admirable. Great numbers of these are bred up to the chase, and are chiefly kept for this purpose, particularly at Quito. The hunters, as Ulloa informs us, are divided into two classes; one part on foot, the other on horseback: the business of the footmen is to rouse the deer; and that of the horsemen, to hunt it down. They all, at break of day, repair to the place appointed, which is generally on the summit of a hill, with every man his greyhound. The horsemen place themselves on the highest peaks; whilst those on foot range the precipices, making a hideous noise, in order to start the deer. Thus the company extend themselves three or four leagues, or more, according to their numbers. On starting any game, the horse which first perceives it sets off, and the rider, being unable to guide or stop him, pursues the chase, sometimes down such a steep slope, that a man on foot, with the greatest care, could hardly keep his legs; from thence he flies up a dangerous ascent, or along the side of a mountain; so that a person not used to this exercise would think it much safer to throw himself out of the saddle, than commit his life to the precipitate ardour of his horse. The other horses which join in the chase do not wait for the riders to animate them; they set forward immediately upon seeing another at full speed; and it becomes prudence in the rider to give them their way, and at the same time to let them feel the spur, to carry him over the precipices. These horses are backed and exercised to this method of hunting; and their usual pace is trotting.

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[13] France possesses various breeds of horses; and although much attention has been paid to improving the different races, the experiment has not been attended with full success. Napoleon was extremely anxious that his horses might cope with those of England, and used every means to procure some of our best blood ones, as well as Arabians. Of late years, many steeds of racing blood have been sold to the French, and some of the nobility have hired persons from England acquainted with breeding; but all their efforts to produce horses equal to ours for beauty, fleetness, and strength, have proved abortive. There are various excellent and serviceable breeds in different provinces; those of Normandy have long been celebrated as carriage and troop horses. During the late war, this province was a great nursery for the cavalry. The Norman horses are tall and strong boned; with considerable spirit, and at the same time docile in their habits. After the Norman conquest, William being sensible of the superiority of this breed, imported many of them into England, and by crossing them with our native breeds, produced good troop horses and roadsters. The best hackneys in France are bred in Limousin; they are closely allied to the Spanish breed, and have in all probability sprung from them. They are also, from their spirit, well calculated for hunters, in which capacity they acquit themselves better than any others of the French stock; but a great drawback is, that they do not arrive at their full strength till they are eight years of age. Auvergne, Poitou, and Burgundy, produce good ponies, called bidets. These horses are better adapted than the Norman steeds, for hunting; but can by no means cope with those of Britain. Good horses for the draught are produced at Boulonnois and Franche Comte. Bretagne. Auot, Navarre, &c., produce good saddle horses, though by no means to be compared to those of Limousin for speed and action, or to the Norman for strength.—Ed.

[14] Ulloa's Voyage, vol. i. p. 464.

There are said to be very good horses in the islands of the Archipelago. Those of Crete were in great reputation among the ancients for their swiftness and force; however, at present they are but little used, even in the country itself, because of the unevenness of the ground, which is there very rocky and mountainous. The original horses of Morocco are much smaller than the Arabian breed; however, they are very swift and vigorous. In Turkey there are to be found horses of almost all races: Arabians, Tartars, Hungarians, and those natural to the place. The latter are very beautiful and elegant; they have a great deal of fire, swiftness, and management; but they are not able to support fatigue: they eat little; they are easily heated; and they have skins so sensible, that they can scarcely bear the rubbing of the stirrup. The Persian horses are, in general, the most beautiful and most valuable of all the East. The pastures in the plains of Media, Persepolis, Ardebil, and Derbent, are excellent for the purpose of rearing them; and there were bred in those places vast numbers, by order of the government of Persia, while that country was under any government. Pietro della Valle prefers the horses of Persia to those of Italy; and informs us, that they are in general of a middle size; and although some are found even of the smallest stature, yet that does not impair their beauty or their strength; yet, in some places they are found of a very good size, and as large as the English saddle-horses are generally found to be: they have all a thin head, a fine crest, a narrow breast, small ears well placed, the legs fine, the hoof hard, and the croup beautiful; they are docile, spirited, nimble, hardy, courageous, and capable of supporting very great fatigue; they run very swiftly, without being easily fatigued; they are strong, and easily nourished, being only supplied with barley and chopped straw; they are put to grass only for six weeks in the spring; they have always the tail at full length, and there is no such thing as geldings among the number; they are defended from the air, as in England, by body-clothes: they attend them with the most punctual exactness; and they are rid generally in a snaffle, without spurs. Great numbers of these are every year transported into Turkey, but chiefly into the East Indies: however, after all, travellers agree that they are not to be compared to the Arabian horses, either for courage, force, or beauty; and that the latter are eagerly sought, even in Persia.

The horses of India are of a very indifferent kind, being weak and washy.[15] Those which are used by the grandees of the country come from Persia and Arabia; they are fed with a small quantity of hay during the day; and at night they have boiled peas, mixed with sugar and butter, instead of oats or barley: this nourishment supports them, and gives them strength; otherwise they would soon sink and degenerate. Those naturally belonging to the country are very small and vicious. Some are so very little, that Tavernier reports, that the young Mogul prince, at the age of seven or eight, rode one of those little horses, that was not much larger than a greyhound: and it is not long since one of these was brought over into this country as a present to our Queen, that measures no more than nine hands high: and is not much larger than a common mastiff. It would seem, that climates excessively hot are unfavourable to this animal. In this manner, the horses of the Gold-Coast, and of Guinea, are extremely little, but very manageable. It is a common exercise with the grandees of that country, who are excellent horsemen, to dart out their lances before them upon full gallop, and to catch them again before they come to the ground. They have a sport also on horseback that requires great dexterity in the rider, and a great share of activity in the horse: they strike off a ball, with a battledore, while they are upon a full gallop, and pursuing it, strike it again before it comes to the ground; and this they continue for a mile together, striking sometimes to the right, and sometimes to the left, with amazing speed and agility.

The horses of China are as indifferent as those of India: they are weak, little, ill-shaped, and cowardly. Those of Corea are not above three feet high; almost all the breed there are made geldings, and are so timorous, that they can be rendered no way serviceable in war; so that it may be said, that the Tartar horses were properly the conquerors of China. These, indeed, are very serviceable in war, and although but of a middle size, yet they are surprisingly patient, vigorous, swift, and bold; their hoofs are extremely hard, though rather too narrow; their heads are fine, but rather too little; the neck is long and stiff; the legs of the longest; and yet, with all these faults, they are found to be an excellent breed. The Tartars live with their horses pretty much in the same manner as the Arabians do; they begin to back them at the age of seven or eight months, placing their children upon them, who manage them even at that early age. By these means they break them by little and little, till at last, about the age of six or seven years, they are capable of enduring amazing hardships. Thus they have been known to march two or three days without once stopping; to continue five or six, without eating anything except a handful of grass at every eight hours; and, besides, to remain without drinking for four and twenty hours. These horses, which are so vigorous in their own country, lose all their strength when they are brought into China or the Indies; but they thrive pretty well in Persia and Turkey. The race of little Tartars towards the north have also a breed of little horses, which they set such a value upon, that it is forbidden to sell them to strangers: these horses have the very same qualities with those of the larger kind; which they probably derive from a similar treatment. There are also very fine horses in Circassia and Mingrelia. There are some greatly esteemed in the Ukraine, in Walachia, Poland, and Sweden; but we have no particular accounts of their excellencies or defects.

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[15] The climate of India does not seem favourable to the horse. The breeds which may be termed native, or such as have been in use from time immemorial, are weak and degenerate. It is found necessary, in order to keep up a good stock, to have horses introduced from foreign countries. The breed called the *Tazee* is, perhaps, of the older kind; they are of a slight make, with long hollow backs, their limbs placed ill below them, and are weak, spiritless animals, while they are extremely irritable and stubborn. The only redeeming quality is the easiness of their paces, which, in a country where the heat is oppressive, is matter of no small consideration.—Ed.

If we consult the ancients on the nature and qualities of the horses of different countries, we learn that the Grecian horses, and particularly those of Thessaly, had the reputation of being excellent for war; that those of Achaia were the largest that were known; that the most beautiful came from Egypt, which bred great numbers; that the horses of Ethiopia were not in esteem, from the heat of the country; that Arabia and Africa furnished very beautiful horses, and very fit for the course; that those of Italy, and particularly of Apulia, were very good; that in Sicily, Cappadocia, Syria, Armenia, Media, and Persia, there were excellent horses, equally esteemed for their speed and vigour; that those of Sardinia and Corsica, though small, were spirited and courageous; that those of Spain resembled the Parthian horses, in being very well adapted for war; that in Walachia and Transylvania, there were horses with bushy tails, and manes hanging down to the ground, which, nevertheless, were extremely swift and active; that the Danish horses were good leapers; those of Scandinavia, though little, were well-shaped, and possessed of great agility; that the Flanders breed was strong; that the Gaulish horses were good for carrying burdens; that the German breeds were so bad, so diminutive, and ill-shaped, that no use could be made of them; that the Swiss and Hungarian horses were good; and, lastly, that those of India were very diminutive and feeble.

Such are the different accounts we have of the various races of horses in different parts of the world. I have hitherto omitted making mention of one particular breed more excellent than any that either the ancients or moderns have produced; and that is our own. It is not without great assiduity and unceasing application, that the English horses are now become superior to those of any other part of the world, for size, strength, swiftness, and beauty. It was not without great attention, and repeated trials of all the best horses in different parts of the world, that we have been thus successful in improving the breed of this animal; so that the English horses are now capable of performing what no others ever could attain to. By a judicious mixture of the several kinds, by the happy difference of our soils, and by our superior skill in management, we have brought this animal to its highest perfection. An English horse, therefore, is now known to excel the Arabian in size and swiftness, to be more durable than the Barb, and more hardy than the Persian. An ordinary racer is known to go at the rate of a mile in two minutes: and we had one instance, in the admirable Childers, of still greater rapidity. He has been frequently known to move above eighty-two feet and a-half in a second, or almost a mile in a minute; he has also run round the course of Newmarket, which is very little less than four miles, in six minutes and forty seconds. But what is surprising, few horses have been since found that ever could equal him; and those of his breed have been remarkably deficient.[16]

However this be, no horses can any way equal our own, either in point of swiftness or strength; and these are the qualifications our horsemen seem chiefly to value. For this reason, when the French, or other foreigners, describe our breed, they all mention, as a fault, the awkward and ungainly motion of our horses; they allow them to be very good, indeed, but they will not grant them an easy or an elegant carriage.[17] But these writers do not consider that this seeming want of grace is entirely the result of our manner of breaking them. We consult only speed and despatch in this animal's motions: the French and other nations are more anxious for parade and spirit. For this reason, we always throw our horses forward, while they put them upon their haunches: we give them an easy swift gait of going, that covers a great deal of ground, they, on the contrary, throw them back, giving them a more showy appearance indeed, but one infinitely less useful. The fault of our manner of breaking is, that the horse is sometimes apt to fall forward: the French managed horse never falls before, but more usually on one side; and for this reason the rider wears stiff boots to guard his legs against such accidents. However, it would be a very easy matter to give our horses all that grace which foreigners are so fond of; but it would certainly take from their swiftness and durability.

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[16] This horse was well known by the name of the Flying, or Devonshire, Childers. He was the property of the Duke of Devonshire, and allowed by sportsmen to be the fleetest horse that ever was bred in the world. He started repeatedly at Newmarket against the best horses of his time, and was never beaten. He won in different prizes, to the amount of nearly £20,000, and was afterwards reserved for breeding. The sire of Childers was an Arabian, sent by a gentleman as a present to his brother in England. Childers was somewhat more than fifteen hands in height. He was foaled in 1715, and was the property of Leonard Childers, Esq. of Carr House, near Doncaster, and sold when young to the Duke of Devonshire. It is said that Childers was first used as a hunter, where he evinced high qualities, and was noted for being very headstrong, as well as vicious. He had not however any restiveness. It is supposed his racing career commenced at five or six, and he beat all competitors at whatever distance. He was never tried at running a single mile, but his speed must have been almost a mile in a minute. He ran over the Beacon course, which is four miles, one furlong, and one hundred and thirty-eight yards, in seven minutes and thirty seconds; covering at every bound a space of about twenty-five feet. On one occasion, he made a spring or leap, with his rider on his back, on level ground, of twenty-five feet. Childers died in the Duke of Devonshire's stud in 1741, aged twenty-six years. There were various other coursers of the same name nearly contemporary with this prince of horses. Bleeding Childers, so named from his having frequent bleedings at the nose, afterwards called Young Childers, and finally Bartlett's Childers; he was full brother to Flying Childers, and was never trained —Ed.

But in what degree of contempt soever foreigners might formerly have held our horses, they have for some time perceived their error, and our English hunters are considered as the noblest and the most useful horses in the world. Our geldings are, therefore, sent over to the continent in great numbers, and sell at very great prices; as for our mares and stallions, there is a law prohibiting their exportation; and one similar to this is said to have obtained even as early as the times of Athelstan, who prohibited their exportation, except where designed as presents.

Roger de Belegme, created Earl of Shrewsbury by William the Conqueror,[18] is the first who is recorded to have made attempts towards the mending our native breed. He introduced Spanish stallions into his estate at Powisland in Wales, from which that part of the country was for many ages after famous for a swift and generous race of horses; however, at that time strength and swiftness were more regarded than beauty; the horses' shapes, in time of action, being entirely hid by a coat of armour which the knights then usually put upon them either by way of ornament or defence.

The number of our horses in London alone, in the time of King Stephen, is said to have amounted to twenty thousand. However, long after, in the times of Queen Elizabeth, the whole kingdom could not supply two thousand horses to form our cavalry.[19] At present, the former numbers seem revived, so that in the late war, we furnished out above thirteen thousand horsemen; and could, if hard pushed, supply above four times that number. How far this great increase of horses among us may be beneficial or otherwise, is not the proper business of the present page to discuss; but certain it is, that where horses increase in too great a degree, men must diminish proportionably; as that food which goes to supply the one, might very easily be converted into nourishment to serve the other. But, perhaps, it may be speculating too remotely, to argue for the diminution of their numbers upon this principle, since every manufacture we export into other countries, takes up room, and may have occupied that place which, in a state of greater simplicity, might have given birth and subsistence to mankind, and have added to population.

Be this as it will, as we have been at such expense and trouble to procure an excellent breed of horses, it is not now to be expected that we should decline the advantages arising from it, just when in our possession. It may be, therefore, the most prudent measure in our legislature, to encourage the breed as a useful branch of commerce, and a natural defence to the country. But how far this end is answered by the breeding up of racers, is what most persons, versed in this subject, are very apt to question. They assert, that the running-horse, as the breed has been for a long time refined, is unfit for any other service than that of the course, being too slight either for the road, the chase, or the combat; and his joints so delicately united, as to render him subject to the smallest accidents. They, therefore, conclude, that less encouragement given to racing would be a means of turning us from breeding rather for swiftness than strength; and that we should thus be again famous for our strong hunters, which they say are wearing out from among us.

How far this may be fact, I will not take upon me to determine, being but little versed in a subject that does not properly come within the compass of natural history. Instead, therefore, of further expatiating on this well-known animal's qualifications, upon which many volumes might easily be written, I will content myself with just mentioning the description of Camerarius, in which he professes to unite all the perfections which a horse ought to be possessed of:—"It must," says he, "have three parts like those of a woman; the breast must be broad, the hips round, and the mane long: it must in three things resemble a lion; its countenance must be fierce, its courage must be great, and its fury irresistible: it must have three things belonging to the sheep; the nose, gentleness, and patience: it must have three of a deer; head, leg, and skin: it must have three of a wolf; throat, neck, and hearing: it must have three of a fox; ear, tail, and trot: three of a serpent; memory, sight, and flexibility: and, lastly, three of a hare; running, walking, and perseverance."

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[17] See Buffon's account of our horses.

[18] British Zoology, vol. i. p. 4. To this work I am indebted for several particulars with regard to the native animals of this island.

[19] See Supplementary Note B, p. 277.

Note A.—*Native Country of the Horse.*

The period at which the horse was first domesticated is now lost in the cloud of antiquity. He is mentioned by the oldest writers; and, in all probability, his subjugation was nearly coeval with the earliest state of society. From the scriptures we learn, that 1,702 years before the Christian era, horses were used. In the 47th chapter of Genesis, verse 17, it is said, "And Joseph gave them (the Egyptians) bread in exchange for horses." Again, in the 50th chapter of the same book, it is said, "And there went up with him (Joseph) both chariots and horsemen; and it was a very great company." These are the first instances of horses being mentioned in Holy Writ; and from what we read in the earlier chapters of Genesis, it seems very probable that the horse was unknown to the Hebrews and Egyptians before that period. In the 12th chapter of that book, it is said, "And he (Abram) had sheep, and oxen, and men-servants, and maid-servants, and she-asses, and camels;" but no mention is made of horses. This was 1,920 years before the birth of our Saviour. It would thus appear that horses were first introduced into Egypt a short time before the year 1702 A.C., but whence we are not informed. They seem to have increased in Canaan with great rapidity; for, in the 11th chapter of Joshua, we are told, "They (certain kings opposed to Joshua) went out, they and all their hosts with them, much people, even as the sand that is upon the sea-shore in multitude, with horses and chariots very many." This was 1,450 years before the Christian era. In Deuteronomy, chapter xvii. verse 16, it is said, "But (whoever shall be king of Israel) shall not multiply horses to himself, nor cause the people to return to Egypt, to the end that he should multiply horses." This proves that Egypt, at that time, was the great place for breeding horses.

Assyria, which is highly celebrated in the Bible for its horses, seems to have obtained them from Armenia, Media, and Persia. The natives of Canaan are spoken of, in Judges, as having used horses in battle, but no mention is made of the Israelites having done so. This people, when at war, made their stronghold among the mountains, so that horses could be of little use to them. When Saul was chosen king, 1,095 years A.C., he led the armies of Israel against the tribes of Arabia, but they had not at that time begun to breed horses, for we find his plunder consisted only of camels, oxen, sheep, and asses. David, the second king of Israel, had cavalry under his command; but in this force his enemies greatly exceeded him, and, it would appear, he did not consider them of very great consequence.

The first breaking of the horse for riding is attributed by some authors to the Lapithæ, and is noticed by Virgil in his third Georgic. Strabo asserts that the Medes, Persians, and Armenians, were the first that invented the art of riding and shooting; Polydorus ascribes it to Bellerophon; Lysias the orator, to the Amazonian women. But be this as it may, it seems indisputable that horses were not used for riding till long after they had been harnessed in war-chariots. Sir Gore Ouseley, in his travels through Persia and various countries of the East, examined all the relics of antiquity, and amongst others the fine sculptures on the ruins of Persepolis, from which he drew a conclusion, at once interesting, and in some measure confirmatory of the opinion above noticed, that the horse has been gradually subdued. He says, "There are no figures mounted on horseback, although some travellers have mentioned horsemen among those sculptures. One would think that the simple act of mounting upon a horse's back would naturally have preceded the use of wheeled carriages, and their complicated harness, yet no horsemen are found at Persepolis; and we know Homer's horses are represented in chariots, from which the warriors sometimes descended to combat on foot; but the poet has not described them as fighting on horseback. The absence of mounted figures might authorize an opinion, that these sculptures had been executed before the time of Cyrus, whose precepts and example first inspired the Persians with a love of equestrian exercises, of which, before his time, they were totally ignorant."

It is a generally received although erroneous opinion that Arabia was the native country of the horse. Even so late as the seventh century of the Christian era, when the prophet Mahomet attacked the Koreish, not far from Mecca, he had only two horses in his train; and although, in the plunder of this horrible campaign, he carried with him in his retreat twenty-four thousand camels, forty thousand sheep, and twenty-four thousand ounces of silver, there is no mention of horses being part of the booty. In the second century, horses were exported from Egypt to Arabia, as presents to various of their kings; and there can be little doubt that their finest horses were originally the produce of Egypt, whence they were also exported to Ethiopia, India, Persia, Parthia, Armenia, Scythia, &c. Solomon is said to have had "four thousand stalls for horses and chariots, and twelve thousand horsemen." The price of an Egyptian horse in those days was one hundred and fifty shekels of silver, which amounts to about seventeen pounds two shillings sterling; a very large sum at that remote period.

Left only to conjecture, we can but suppose, from a combination of circumstances, that Asia was the original country of the horse; for there he is found to the present day, roving in unrestrained freedom, and we are without any historical record of his having been introduced by man into those extensive wilds. One thing is quite certain, that he was not found either in America or New Holland, at the original discovery of these continents. The great tracts of desert country around the sea of Arial and the Caspian sea, have been supposed to be the native residence of the horse; but, if this conjecture be correct, he must have widely extended his geographical range, for he is found in a wild state in Asia as far north as the sixtieth degree, and to the utmost southern extremes of that vast continent, and also in many parts of Africa.

Note B.—*History of the Horse in Britain.*

The earliest record of the horse in Great Britain is contained in the history given by Julius Cæsar of his invasion of our island. The British army was accompanied by numerous war-chariots drawn by horses. Short scythes were fastened to the ends of the axletrees, sweeping down every thing before them, and carrying terror and devastation into the ranks of their enemies. The conqueror gives a most animated description of the dexterity with which the horses were managed. What kind of horse the Britons then possessed, it would be useless to inquire; but, from the cumbrous structure of the car, and the fury with which it was driven, and from the badness or nonexistence of the roads, they must have been both active and powerful in an extraordinary degree. Cæsar deemed them so valuable that he carried many of them to Rome, and British horses were, for a considerable period afterwards, in great request in various parts of the Roman empire. Horses must at that time have been exceedingly numerous in Britain, for we are told that when the British king, Cassibelaunus, dismissed the main body of his army, he retained four thousand of his war-chariots for the purpose of harassing the Romans when they attempted to forage. The British horse now received its first cross; but whether the breed was thereby improved cannot be ascertained. The Romans having established themselves in Britain, found it necessary to send over a numerous body of cavalry to maintain a chain of posts and check the frequent insurrections of the natives. The Roman horses would breed with those of the country, and to a greater or less extent change their character; and from this time, the English horse would consist of a compound of the native animal, and those from Gaul, Italy, Spain, and every province from which the Roman cavalry was supplied.

Many centuries afterwards passed by, and we have no record of the character or value, improvement or deterioration, of the animal. It would appear probable, however, that Athelstan, the natural son of Alfred the Great, and the second in succession to him, paid some attention to the improvement of the horse; for having subdued all the rebellious portions of the heptarchy, he was congratulated on his success by some of the continental princes, and received from Hugh Caput of France—who solicited his sister in marriage — various presents doubtless of a nature that would be thought most acceptable to him, and among them several German *running horses*. Hence our breed received another cross, and probably an improvement. Athelstan seems to have seriously devoted himself to this important object, for he soon afterwards decreed (A. D. 930) that no horses should be sent abroad for sale, or on any account, except as royal presents. This proves his anxiety to preserve the breed, and likewise renders it probable that that breed was beginning to be esteemed by our neighbours. In a document bearing date A. D. 1000, we have an interesting account of the relative value of the horse. If a horse was destroyed, or negligently lost, the compensation to be demanded was thirty shillings; for a mare or colt, twenty shillings; a mule or young ass, twelve shillings; an ox, thirty pence; a cow, twenty-four pence; a pig, eightpence; and for a man, one pound.[*] In the laws of Howell the Good, Prince of Wales, passed a little before this time, there are some curious particulars respecting the value and sale of horses. The value of a foal not fourteen days old is fixed at fourpence; at one year and a day it is estimated at forty-eight pence; and at three years sixty pence. It was then to be tamed with the bridle, and brought up either as a palfrey or a serving horse, when its value became one hundred and twenty pence, and that of a wild or unbroken mare, sixty pence. Even in those early days, the frauds of dealers were notorious, and the following singular regulations were established. The buyer was allowed time to ascertain whether the horse was free from three diseases. He had three nights to prove him for the staggers; three months to prove the soundness of his lungs; and one year to ascertain whether he was affected with glanders. For every blemish discovered after the purchase, one-third of the money was to be returned, except it should be a blemish of the ears or tail. The practice of letting horses for hire was then known, and then, as now, the services of the poor hack were too brutally exacted. The benevolent Howell disdains not to legislate for the protection of this abused, and valuable servant. "Whoever shall borrow a horse, and rub the hair so as to gall the back, shall pay fourpence; if the skin is forced into the flesh, eightpence; if the flesh be forced into the bone, sixteenpence."

One circumstance deserves to be remarked, that in none of the earliest historical records of the Anglo-Saxons or the Welsh, is there any allusion to the use of the horse for the plough. Until a comparatively recent period, oxen alone were used in England, as in other countries, for this purpose; but about this time — the latter part of the tenth century—some innovation on this point was creeping in, and, therefore, a Welsh law forbids the farmer to plough with horses, mares, or cows, but with oxen alone. On one of the pieces of tapestry woven at Bayonne in the time of William the Conqueror (A. D. 1066), there is the figure of a man driving a horse attached to a harrow. This is the earliest notice we have of the use of the horse in field-labour. With the Conqueror came a marked improvement in the British horse. To his superiority in cavalry this prince was chiefly indebted for the victory of Hastings. The favourite charger of William was a Spaniard. His followers, both the barons and the common soldiers, came principally from a country in which agriculture had made more rapid progress than in England. A very considerable portion of the kingdom was divided among these men; and it cannot be doubted that, however unjust was the usurpation of the Norman, England benefited in its husbandry, and particularly in its horses, by the change of masters. Some of the barons, and particularly Roger de Boulogne, Earl of Shrewsbury, introduced the Spanish horse on their newly acquired estates. The historians of these times, however, who were principally monks, knowing nothing about horses, give us very little information on the subject.

In the reign of Henry I. (A. D. 1121) the first Arabian horse, or, at least, the first on record, was introduced. Alexander I., of Scotland, presented to the church of St. Andrews, an Arabian horse, with costly furniture, Turkish armour, many valuable trinkets, and a considerable estate. Forty years afterwards, in the reign of Henry II., Smithfield was celebrated as a horse-market. Fitz-Stephen, who lived at that time, gives the following animated account of the manner in which the hackneys and charging-steeds were tried there, by racing against one another. "When a race is to be run by this sort of horses, and perhaps by others, which also in their kind are strong and fleet, a shout is immediately raised, and the common horses are ordered to withdraw out of the way. Three jockeys, or sometimes only two, as the match is made, prepare themselves for the contest. The horses on their part are not without emulation; they tremble and are impatient, and are continually in motion. At last, the signal once given, they start, devour the course, and hurry along with unremitting swiftness. The jockeys, inspired with the thought of applause, and the hope of victory, clap spurs to their willing horses, brandish their whips, and cheer them with their cries." This description reminds us of the more lengthened races of the present day, and proves the blood of the English horse, even before the Eastern breed was tried.

Close on this followed the Crusades. The champions of the Cross certainly had it in their power to enrich their native country with some of the choicest specimens of Eastern horses. The war-steed was defended by mail or plate much on the plan of the harness of the knight himself. His head was ornamented with a crest. The head, chest, and flanks, were wholly or partially protected; sometimes he was clad in complete steel, with the arms of his master engraved or embossed on his bardings. The bridle of the horse was always as splendid as the circumstances of the knight allowed, and thus a horse was often called Brigliadore, from *briglia d'oro*, a bridle of gold. Bells were a very favourite addition to the equipment of the horse. The old Troubadour, Arnold of Marson, says, that "nothing is so proper to inspire confidence in a knight, and terror in an enemy."

To King John, hateful as he was in all other respects, we are yet much indebted for the attention which he paid to agriculture generally, and particularly to improving the breed of horses. He imported one hundred chosen stallions of the Flanders kind, and thus mainly contributed to prepare our noble species of draught horses, as unrivalled as the horses of the turf. One hundred years afterwards, Edward II. purchased thirty Lombardy war-horses, and twelve heavy draught-horses. Lombardy, Italy, and Spain, were the countries whence the greater part of Europe was then supplied with the most valuable cavalry or parade horses. Horses for agricultural purposes were chiefly procured from Flanders. Edward III. devoted one thousand marks to the purchase of fifty Spanish horses; and of such importance did he conceive this addition to the English, or rather mingled blood, then existing, that formal application was made to the kings of France and Spain to grant safe-conduct to the troop. When they had safely arrived at the royal stud, it was computed that they had cost the monarch no less than thirteen pounds six shillings and eightpence per horse, equal in value to one hundred and sixty pounds of our present money. This monarch had many "running-horses." The precise meaning of the term is not, however, clear. It might be light and speedy horses in opposition to the war-horse, or those that were literally used for the purpose of racing. The average price of these running-horses was twenty marks, or three pounds six shillings and eightpence. Edward was devoted to the sports of the turf or the field, or he began to see the propriety of crossing our stately and heavy breed with those of a lighter structure and greater speed. There was, however, one impediment to this, which was not for a very long period removed. The soldier was cased in heavy armour. The knight with all his accoutrements, often rode more than twenty-five stone. No little bulk and strength were required in the animals destined to carry this back-breaking weight. When the musket was substituted for the cross-bow and battle-axe, and this iron defence, cumbrous to the wearer and destructive to the horse, becoming useless, was laid aside, the improvement of the British horse in reality commenced. While Edward was thus eager to avail himself of foreign blood, with the too frequent selfishness of the sportsman he would let no neighbour share in the advantage. The exportation of horses was forbidden under very heavy penalties. One case in which he relaxed from his severity is mentioned, when he permitted a German merchant to re-export some Flanders horses which he had brought on speculation; but he was strictly forbidden to send them to Scotland. Nay, so jealous were these sister-kingdoms of each other's prosperity, that so late as the time of Elizabeth, it was felony to export horses from England to Scotland.

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[*] According to the Anglo-Saxon computation, forty-eight shillings made a pound, equal in silver to about three pounds of our present money, in value to fifteen or sixteen pounds, and five pence made one shilling.

The English horse was advancing, although slowly, to an equality with, or even superiority over, those of neighbouring countries. His value began to be more generally and highly estimated, and his price rapidly increased; so much so, that breeders and the dealers, then, as now, skilful in imposing on the inexperienced, obtained from many of our young grandees enormous prices for them. This evil magnified to such an extent, that Richard II. (1386) interfered to regulate and determine the price. The proclamation which he issued is interesting, not only as proving the increased value of the horse, but showing what were four hundred and fifty years ago, and what are, still, the chief breeding districts. It was ordered to be published in the counties of Lincoln and Cambridge, and the East and North Ridings of Yorkshire; and the price of the horse was restricted to that which had been determined by former sovereigns. A more enlightened policy has at length banished all such absurd interferences with agriculture and commerce. We can now collect but little of the history of the horse, until the reign of Henry VII. at the close of the fifteenth century. He continued to prohibit the exportation of stallions, but allowed that of mares when more than two years old, and under the value of six shillings and eightpence. This regulation was, however, easily evaded, for if a mare could be found worth more than six shillings and eightpence, she might be freely exported on the payment of that sum. Henry VIII., a tyrannical and cruel prince, but fond of show and splendour, was very anxious to produce a valuable breed of horses; and the means which he adopted were both perfectly in unison with his arbitrary disposition, and very little calculated to effect his object. He affixed a certain standard below which no horse should be kept. The lowest height for the stallion was fifteen hands, and for the mare thirteen hands; and even before they had arrived at their full growth, no stallion above two years old, and under fourteen hands and a half, was permitted to run on any forest moor or common, where there were mares. At "Michaelmastide" the neighbouring magistrates were ordered to "drive" all forests and commons, and not only destroy such stallions, but all "unlikely tits," whether mares, or geldings, or foals which they might deem not calculated to produce a valuable breed. He likewise ordained, that in every deer-park, a certain number of mares in proportion to its size, and each at least thirteen hands high, should be kept; and that all his prelates and nobles, and "all those whose wives wore velvet bonnets" should keep stallions for the saddle at least fifteen hands high. These ordinances perished with the tyrant by whom they were promulgated. The tyrannical edicts of Henry VIII. had the effect which common sense would have anticipated,—the breed of horses was not materially improved, and their numbers were sadly diminished. When Philip of Spain threatened England, in the reign of Elizabeth, with his Invincible Armada, that princess could muster in her whole kingdom only three thousand cavalry to oppose him; and Blundeville, who wrote at this time a very pleasant and excellent book on the art of riding, speaks contemptuously of the qualities of these horses. The secret of improving the breed had not then been discovered; it had been attempted by arbitrary power; and it had extended only to those crosses from which little good could have been expected: or rather it had more reference to the actual situation of the country, and the heavy carriages, and the bad roads, and the tedious travelling which then prevailed, then to the wonderful change in these which a few centuries were destined to effect. Blundeville describes the majority of our horses as consisting of strong sturdy beasts, fit only for slow draught, and the few of a lighter structure being weak and without bottom. There were, however, some exceptions; for he relates a case of one of these lighter horses travelling eighty miles in a day—a task which in later times has been too often and cruelly exacted from our half-bred nags.

An account has been given of the racing trial of the horses in Smithfield market. Regular races were now established in various parts of England. Meetings of this kind were first held at Chester and Stamford; but there was no acknowledged system as now; and no breed of racing horses. Hunters and hackneys mingled together, and no description of horse was excluded. There was at first no course marked out for the race, but the contest generally consisted in the running of train-scent across the country, and sometimes the most difficult and dangerous part of the country was selected for the exhibition. Occasionally our present steeple-chase was adopted with all its dangers, and more than its present barbarity; for persons were appointed cruelly to flog along the jaded and exhausted horses. It should, however, be acknowledged that the races of that period were not disgraced by the system of gambling and fraud, which seems to have become almost inseparable from the amusements of the turf. The prize was usually a wooden bell adorned with flowers. This was afterwards exchanged for a silver bell, and "given to him who should run the best and farthest on horseback on Shrove Tuesday." Hence the common phrase of "bearing away the bell."

It was not until the last year of the reign of James I., that rules were promulgated and generally subscribed to for the regulation of horse-races. That prince was fond of field-sports. He had encouraged if he did not establish horse-racing in Scotland, and he brought with him to England his predilection for it; but his races were more often matches against time, or trials of speed and bottom, for absurdly and cruelly long distances. His favourite courses were at Croydon and on Enfield chase. Although the Turkish and Barbary horses have been freely used to produce with the English mare the breed which was best suited to this exercise, little improvement had been effected. James, with great judgment, determined to try the Arab breed. Probably, he had not forgotten the story of the Arabian which had been presented to one of his Scottish churches, five centuries before. He purchased from a merchant named Markham, a celebrated Arabian horse, for which he gave the extravagant sum of five hundred pounds. Kings, however, like their subjects, are often thwarted and governed by their servants, and the Duke of Newcastle took a dislike to this foreign animal. He wrote a book, and a very good one, on horsemanship, and described this Arabian as a little bony horse, of ordinary shape, setting him down as good for nothing, because, after being regularly trained, he could not race. The opinion of the Duke, probably altogether erroneous, had, for nearly a century, great weight; and the Arabian horse lost its reputation among the English turf-breeders. A South-Eastern horse was afterwards brought into England, and purchased by James, of Mr. Place, who was afterwards stud-master, or groom, to Oliver Cromwell. This beautiful animal was called the White Turk, and his name and that of his keeper will long be remembered. Shortly afterwards appeared the Helmsley Turk, introduced by Villiers, the first duke of Buckingham. He was followed by Fairfax's Morocco Barb. These horses speedily effected a considerable change in the character of our breed, so that Lord Harleigh, one of the old school, complained that the great horse was fast disappearing, and that horses were now bred light and fine for the sake of speed only.

Charles I. ardently pursued this favourite object of English gentlemen, and a little before his rupture with the parliament, established races in Hyde Park, and at Newmarket. The civil war somewhat suspended the improvement of the breed; yet the advantage which was derived by both parties from a light and active cavalry, sufficiently proved the importance of the change which had been effected; and Cromwell perceiving, with his wonted sagacity, how much these pursuits were connected with the prosperity of the country, had his stud of race-horses.

At the Restoration a new impulse was given to the cultivation of the horse by the inclination of the court to patronize gaiety and dissipation. The races at Newmarket were restored, and as an additional spur to emulation, royal plates were now given at each of the principal courses. Charles II. sent his master-of-the-horse to the Levant, to purchase brood-mares and stallions. These were principally Barbs and Turks. From that period to the middle of the last century the system of improvement was zealously pursued: every variety of Eastern blood was occasionally engrafted on ours, and the superiority of the engrafted, above the very best of the original stock, began to be evident.

Man is rarely satisfied with any degree of perfection in the object on which he has set his heart. The sportsman had now beauty of form, and speed and stoutness, scarcely an approach to which had been observed in the original breed. Still some imagined that speed and stoutness might possibly be increased; and Mr. Darley, in the latter part of the reign of Queen Anne, had recourse to the discarded and despised Arabian. He had much prejudice to contend with, and it was some time before the Darley Arabian attracted notice. At length the value of his produce began to be recognised, and to him we are greatly indebted for a breed of horses of unequalled beauty, speed, and strength. This last improvement now furnishes all that can be desired: nor is this true only of the thorough-bred or turf-horse; it is, to a very material degree, the case with every description of horse. By a judicious admixture and proportion of blood we have rendered our hunters, our hackneys, our coach, nay even our cart horses, much stronger, more active, and more enduring than they were before the introduction of the race-horse.

CHAP. II.

OF THE ASS.[1]

Although this animal is very easily distinguished from the horse at first sight, yet upon a closer inspection, the similitude between them is very striking.[2] They have both a similar outline in the external parts; the same conformation within. One would be led, from the great resemblance there is between them, to suppose them of the same species; and that the ass was only a horse degenerated: however, they are perfectly distinct, and there is an inseparable line drawn between them, for the mule they produce is barren. This seems to be the barrier between every species of animals; this keeps them asunder, and preserves the unities of their form. If the mule, or the monster, bred between two animals, whose form nearly approaches, is no longer fertile, we may then conclude, that these animals, however resembling, are of different kinds. Nature has providently stopped the fruitfulness of these ill-formed productions, in order to preserve the form of every animal uncontaminated: were it not for this, the races would quickly be mixed with each other; no one kind would preserve its original perfection; every creature would quickly degenerate; and the world would be stocked with imperfection and deformity.

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[1] Many parts of this account are extracted from Daubenton and Buffon; which I mention here, to avoid troubling the reader with a multiplicity of quotations.

[2] The head of the ass is large and thick; the ears very long, the mane short and erect, with a dark brown stripe from the shoulders to the insertion of the tail, which is thick, covered with short hairs, and stunted towards its end. A dark stripe extends from the top of the withers to the insertion of the thigh, on each shoulder: the whole animal is covered with thickset woolly-like hair. His general colour is ash-coloured brown; sometimes chestnut; very dark brown, approaching to black; and sometimes, though rarely, white. The ass is three or four years in coming to perfection, but will propagate when two years old, and will continue to do so till about twenty-five years of age; Ælian says till thirty; alluding, probably, to those in eastern climates. The female goes with young above eleven months, and rarely brings forth more than one at a time. This animal seldom lies down to rest, unless extremely fatigued; he sleeps standing, and requires much less repose than the horse.—Ed.

The horse and the ass, therefore, though so nearly approaching in form, are of two distinct kinds, different in their natures; and were there but one of each kind, both races would then be extinguished. Their shapes and their habits may, indeed, be very nearly alike; but there is something in every animal, besides its conformation or way of life, that determines its specific nature. Thus there is much greater resemblance between the horse and the ass, than between the sheep and the goat: and yet the latter produce an animal that is by no means barren, but which quickly reproduces an offspring resembling the sheep; while the mule of the former is marked with certain sterility. The goat and the sheep may be therefore said to be of one kind, although so much unlike in figure; while the horse and the ass are perfectly distinct, though so closely resembling. It has, indeed, been said by Aristotle, that their male is sometimes prolific; this, however, has not been confirmed by any other testimony, although there has elapsed a period of near two thousand years to collect the evidence.

But what tends to put the subject out of dispute, is, that the two animals are found in a state of nature entirely different. The onager, or wild ass, is seen in still greater abundance than the wild horse; and the peculiarities of its kind are more distinctly marked than in those of the tame one. Had it been a horse degenerated, the likeness would be stronger between them, the higher we went to the original stock from whence both have been supposed to be sprung. The wild animals of both kinds would, in such a case, resemble each other, much more than those of the tame kind, upon whom art has, for a succession of ages, been exercising all its force, and producing strange habits and new alterations. The contrary, however, obtains, and the wild ass is even more assinine, if I may so express it, than that bred in a state of domestic servitude; and has even a natural aversion to the horse, as the reader will shortly learn.

The wild ass has, by some writers, been confounded with the zebra, but very improperly, for they are of a very different species. The wild ass is not streaked like the zebra, nor is his shape so beautiful; his figure is pretty much the same as that of the common ass, except that he is of a brighter colour, and has a white list running from his head to his tail. This animal is found wild in many islands of the Archipelago, particularly in that of Cerigo. There are many wild asses in the deserts of Libya and Numidia, that run with such amazing swiftness that scarcely even the coursers of the country can overtake them. When they see a man, they set up a horrid braying, and stop short all together, till he approaches near them; they then, as if by common consent, fly off with great speed; and it is upon such occasions that they generally fall into the traps which are previously prepared to catch them. The natives take them chiefly upon account of their flesh, which they esteem as delicious eating; and for their skins, of which that kind of leather is made which is called *shagreen*.[3]

Olearius relates, that the monarch of Persia invited him on a certain day to be present at an entertainment of a very peculiar nature, which was exhibited in a small building, near the palace, resembling a theatre. After a collation of fruits and sweetmeats, more than thirty of these wild asses were driven into the area, among which the monarch discharged several shot, and some arrows, and in which he was imitated by some of the rest of his attendants. The asses, finding themselves wounded, and no way of escaping, instantly began to attack each other, biting with great fierceness, and braying terribly. In this manner they continued their mutual animosity, while the arrows were poured in from above, until they were all killed: upon which they were ordered to be taken, and sent to the king's kitchen at Ispahan. The Persians esteem the flesh of this animal so highly, that its delicacy is even become a proverb among them. What may be the taste of wild ass's flesh, we are unable to say; but certain it is, that the flesh of the tame ass is the worst that can be obtained, being drier, more tough, and more disagreeable than horse-flesh. Galen even says that it is very unwholesome. Yet we should not judge hastily upon the different tastes of different people, in the preference they give to certain meats. The climate produces very great changes in the tenderness and the savour of several viands: that beef, for instance, which is so juicy and good in England, is extrêmely tough and dry when killed under the line; on the contrary, that pork, which is with us so unpalatable in summer, in the warmer latitudes, where it is always hotter than here, is the finest eating they have, and much preferable to any hog's flesh in Europe.

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[3] Wild asses live in herds, each consisting of a chief, and several mares and colts, sometimes to the number of twenty. They are excessively timid, and provident against danger. A male takes upon him the care of the herd, and is always on the watch. If they observe a hunter who, by creeping along the ground, has got near them, the sentinel takes a great circuit, and goes round and round him, as if discovering somewhat to be apprehended. As soon as the animal is satisfied, he rejoins the herd, which sets off with great precipitation. Sometimes his curiosity costs him his life; for he approaches so near as to give the hunter an opportunity of shooting him. The senses of hearing and smelling in these animals are most exquisite; so that they are not in general to be approached without the utmost difficulty. "The wild asses did stand in the high places," says the prophet Jeremiah: "they snuffed up the wind like dragons." The Persians catch them, and break them for the draught. They make pits, which they fill about half-way up with plants; into these the asses fall without bruising themselves, and are taken thence alive. When completely domesticated, they are very valuable, and sell at a high price, being at all times celebrated for their amazing swiftness. The food of the wild asses is the saltest plants of the desert; such as the artiplex, kali, and chenopondium; and also the bitter musky tribe of herbs. They also prefer salt water to fresh.—This is exactly conformable to the history given of this animal in the book of Job; for the words "barren land," expressive of his dwelling, ought, according to the learned Bochart, to be rendered *salt places*. The hunters generally lie in wait for the asses near the ponds of brackish water, to which they resort to drink.—Ed.

The ass, like the horse, was originally imported into America by the Spaniards, and afterwards by other nations. That country seems to have been peculiarly favourable to this race of animals; and where they have run wild, they have multiplied in such numbers, that in some places they have become a nuisance. In the kingdom of Quito, the owners of the grounds where they are bred, suffer all persons to take away as many as they can, on paying a small acknowledgment, in proportion to the number of days their sport lasts. They catch them in the following manner. A number of persons go on horseback, and are attended by Indians on foot: when arrived at the proper places, they form a circle, in order to drive them into some valley; where, at full speed, they throw the noose, and endeavour to halter them. Those creatures, finding themselves enclosed, make very furious efforts to escape; and, if only one forces his way through, they all follow with an irresistible impetuosity. However, when noosed, the hunters throw them down, and secure them with fetters, and thus leave them till the chase is over. Then, in order to bring them away with greater facility, they pair them with tame beasts of the same kind; but this is not easily performed, for they are so remarkably fierce that they often hurt the persons who undertake to manage them. They have all the swiftness of horses, and neither declivities nor precipices can retard their career. When attacked, they defend themselves with their heels and mouth with such activity, that without slackening their pace, they often maim their pursuers. But the most remarkable property in these creatures is, that, after carrying their first load, their celerity leaves them, their dangerous ferocity is lost, and they soon contract the stupid look and dulness peculiar to the assinine species. It is also observable, that these creatures will not permit a horse to live among them. They always feed together; and if a horse happens to stray into the place where they graze, they all fall upon him; and, without giving him the liberty of flying, they bite and kick him till they leave him for dead upon the spot.[4]

Such is this animal in its natural state, swift, fierce, and formidable: but, in the state of tameness, the ass presents a very different picture: the moment his native liberty is repressed, he seems entirely to give up all claims to freedom; and he assumes a patience and submission even humbler than his situation. He is, in a state of tameness, the most gentle and quiet of all animals. He suffers with constancy, and, perhaps, with courage, all the ill-treatment that cruelty and caprice are pleased to inflict. He is temperate with regard to the quantity and the quality of his provision. He is contented with the most neglected weeds; and makes his humble repast upon what the horse and other animals leave behind. If he gives the preference to any vegetable, it is to the plantain; for which he is often seen to neglect every other herb in the pasture: but he is chiefly delicate with respect to his water; he drinks only at the clearest brooks, and chiefly those to which he has been accustomed. He drinks as soberly as he eats; and never, like the horse, dips his nose into the stream. As he is seldom saddled, he frequently rolls himself upon the grass; and lies down, for this purpose, as often as he has opportunity, without minding what becomes of his burden. He never rolls, like the horse, in the mud; he even fears to wet his feet; and turns out of his way to avoid the dirty parts of a road. When very young, the ass is sprightly, and even tolerably handsome; but he soon loses these qualifications, either by age or bad treatment, and he becomes slow, stupid, and headstrong. He seems to show no ardour, except for the female, having been often known to die after the covering. The she-ass is not less fond of her young than the male is of her; and we are assured that she will cross fire or water to protect or rejoin it. This animal is sometimes not less attached to his owner; by whom he is too often abused. He scents him at a distance, and distinguishes him from others in a crowd; he knows the ways he has passed and the places where he inhabits.

When overloaded, the ass shows the injustice of his master, by hanging down his head and lowering his ears; when he is too hard pressed, he opens his mouth and draws back his lips, in a very disagreeable manner. If his eyes are covered he will not stir a step; and, if he is laid down in such a manner that one is covered with the grass while the other is hidden with a stone, or whatever is next at hand, he will continue fixed in the same situation, and he will not so much as attempt to rise to free himself from those slight impediments. He walks, trots, and gallops, like a horse; but although he sets out very freely at first, yet he is soon tired; and then no beating will make him mend his pace. It is in vain that his unmerciful rider exerts his whip or his cudgel; the poor little animal bears it all with patience, and without a groan; and, conscious of his own imbecility, does not offer even to move.

Notwithstanding the stupid heaviness of his air, he may be educated with as much ease as any other animal; and several have been brought up to perform, and exhibit as a show. In general, however, the poor animal is entirely neglected. Man despises this humble, useful creature, whose efforts are exerted to please him, and whose services are too cheaply purchased. The horse is the only favourite, and upon him alone all expense and labour are bestowed. He is fed, attended, and stabled, while the ass is abandoned to the cruelty of the lowest rustics, or even to the sport of children; and instead of gaining by the lessons he receives, is always a loser. He is conducted along by blows; he is insulted by unnecessary stripes; he is overloaded by the lazy; and, being generally the property of the poor, he shares with them in their distresses. Thus this faithful animal, which, were there no horses, would be the first of the quadruped kind in our esteem, is now considered as nothing; his properties and qualifications being found in a higher degree elsewhere, he is entirely disregarded; and, from being the second, he is degraded into one of the most useless of the domestic quadrupeds.[5]

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[4] Ulloa, vol. i. p. 316.

For this reason, very little care has been taken to improve the breed; it is suffered to degenerate; and it is probable, that of all other animals this alone is rendered feebler and more diminutive by being in a state of domestic servitude. The horse, the cow, and the sheep, are rendered larger by the assiduity of man; the ass is suffered to dwindle every generation, and particularly in England, where it is probable that, but for the medicinal qualities of its milk, the whole species would have ere now been extinguished. Nevertheless, we have good reasons to believe that, were the same care bestowed on the ass that is spent upon the horse, were the same industry used in crossing the breed and improving it, we should see the ass become, from his present mean state, a very portly and serviceable animal; we should find him rival the horse in some of his perfections, and exceed him in others. The ass, bulk for bulk, is stronger than the horse; is more sure-footed; and though more slow in his motions, he is much less apt to start out of the way.

The Spaniards, of all people in Europe, seem alone to be acquainted with the value of the ass. They take all proper precautions to improve the breed; and I have seen a jack-ass from that country above fifteen hands high. This animal, however, seems originally a native of Arabia. A warm climate is known to produce the largest and the best; their size and spirit decline in proportion as they advance into colder regions.

Though now so common in all parts of England, the ass was entirely lost among us during the reign of Queen Elizabeth. Holinshed informs us that our land did yield no asses.[6] However, there are accounts of their being common in England before that time. In Sweden, they are at present a sort of rarity; nor does it appear by the last history of Norway, that they have yet reached that country. It is in the hotter climates alone that we are to look for the original of this serviceable creature. In Guinea, they are larger and more beautiful than even the horses of the same country. In Persia, they have two kinds; one of which is used for burdens, being slow and heavy; the other, which is kept for the saddle, being smooth, stately, and nimble. They are managed as horses, only that the rider sits nearer the crupper, and they are taught to amble like them. They generally cleave their nostrils to give them more room for breathing, and many of these are sold for forty or fifty pounds.

The ass is a much more hardy animal than the horse, and liable to fewer diseases. Of all animals covered with hair, he is the least subject to vermin, for he has no lice, probably owing to the dryness and the hardness of his skin. Like the horse, he is three or four years in coming to perfection; he lives till twenty or twenty-five; sleeps much less than the horse; and never lies down for that purpose, unless very much tired. The she-ass goes above eleven months with young, and never brings forth more than one at a time. The mule may be engendered either between a horse and a she-ass, or between a jack-ass and a mare.[7] The latter breed is every way preferable, being larger, stronger, and better shaped. It is not yet well known whether the animal called the Gimerro be one of these kinds; or, as is asserted, bred between the ass and the bull. While naturalists affirm the impossibility of this mixture, the natives of the alpine countries, where this animal is bred, as strongly insist upon its reality. The common mule is very healthy, and will live above thirty years, being found very serviceable in carrying burdens, particularly in mountainous and stony places, where horses are not so sure-footed. The size and strength of our asses is at present greatly improved by the importation of Spanish jack-asses; and it is probable we may come in time to equal the Spaniards in breeding them, where it is not uncommon to give fifty or sixty guineas for a mule; and, indeed, in some mountainous countries, the inhabitants cannot do well without them. Their manner of going down the precipices of the Alps or the Andes is very extraordinary; and with it we will conclude their history. In these passages, on one side, are steep eminences, and, on the other, frightful abysses; and, as they generally follow the direction of the mountain, the road, instead of lying in a level, forms at every little distance steep declivities, of several hundred yards downward. These can only be descended by mules; and the animal itself seems sensible of the danger, and the caution that is to be used in such descents. When they come to the edge of one of these descents, they stop, without being checked by the rider; and, if he inadvertently attempts to spur them on, they continue immoveable. They seem all this time ruminating on the danger that lies before them, and preparing themselves for the encounter. They not only attentively view the road, but tremble and snort at the danger. Having prepared for the descent, they place their fore-feet in a posture as if they were stopping themselves; they then also put their hinder-feet together, but a little forward, as if they were going to lie down. In this attitude, having taken, as it were, a survey of the road, they slide down with the swiftness of a meteor. In the meantime, all the rider has to do is to keep himself fast on the saddle, without checking the rein, for the least motion is sufficient to disorder the equilibrium of the mule; in which case they both unavoidably perish. But their address in this rapid descent is truly wonderful; for in their swiftest motion, when they seem to have lost all government of themselves, they follow exactly all the different windings of the road, as if they had previously settled in their minds the route they were to follow, and taken every precaution for their safety. In this journey, the natives, who are placed along the sides of the mountains, and hold by the roots of the trees, animate the beast with shouts, and encourage him to perseverance. Some mules, after being long used to these journeys, acquire a kind of reputation for their safety and skill; and their value rises in proportion to their fame.[8]

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[5] In early times, the ass was not, as is now the case with us, considered a despicable animal; for we find that he was rode by the rich and noble, in preference to the horse; as will appear from the following instances, from many that are recorded in the Sacred Writings:—When Abraham went to offer his son Isaac, he rode upon an ass; Judah and his brethren rode on asses when they went down to Egypt to purchase corn; and we are told that when Moses left Jethro, his father-in-law, he took his wife and his sons, and set them upon asses, and returned to Egypt. In the enumeration of Job's property, which appears to have been very great, we find that he had five hundred she-asses; and, in his prosperity, he is said to have had a thousand she-asses. It is likely that the preference of females arose from the circumstance, that the ass can subsist on a scanty and coarse fare; so that, in the patriarchal ages, the she-ass would not only bear the rider through the desert and barren tracts, but also, with her milk contribute to the support of her master. Jair, the Gileadite, one of the judges of Israel, had thirty sons, who rode on thirty ass-colts. Anah, the Horite prince, did not think it derogatory to his rank to feed the asses of Zibeon his father. In ancient times the ass was used for drawing chariots; for, when Isaiah predicted the fall of Babylon, he describes the watchman as seeing "a chariot with a couple of horseman, a chariot of asses, and a chariot of camels." Herodotus says, the Indians had war-chariots drawn by wild asses. The Jews considered the ass as an unclean animal because his hoof was not cloven, and he did not chew the cud; therefore refrained from eating his flesh, and offering him as a sacrifice. But we find that, in cases of want, these laws were disregarded; for, when Samaria was besieged by the Syrians, "an ass's head was sold for fourscore pieces of silver." The contempt of the Jews for this beast did not cease with his existence; for, unlike other animals, which, when they died, were buried under ground, he was thrown into the fields or ditches, to be eaten by wild beasts or birds. Such also was the burial of their criminals, or those they wished to treat with ignominy; Jehoiakim, the king of Judah, was doomed to be thus treated,—"He shall be buried with the burial of an ass, drawn and cast forth beyond the gates of Jerusalem."—*Supplement to the English edition of Cuvier's Animal Kingdom.*

[6] British Zoology, vol. i. p. 11.

CHAP. III.

OF THE ZEBRA.

THERE are but three animals of the horse kind.[1] The horse, which is the most stately and courageous; the ass, which is the most patient and humble; and the zebra, which is the most beautiful, but at the same time the wildest animal in nature. Nothing can exceed the delicate regularity of this creature's colour, or the lustrous smoothness of its skin; but on the other hand, nothing can be more timid or more untameable.

It is chiefly a native of the southern parts of Africa; and there are whole herds of them often seen feeding in those extensive plains that lie towards the Cape of Good Hope. However, their watchfulness is such, that they will suffer nothing to come near them, and their swiftness so great, that they readily leave every pursuer far behind. The zebra in shape rather resembles the mule, than the horse or the ass. It is rather less than the former, and yet larger than the latter. Its ears are not so long as those of the ass, and yet not so small as in the horse kind. Like the ass, its head is large, its back straight, its legs finely placed, and its tail tufted at the end; like the horse its skin is smooth and close, and its hind quarters round and fleshy. But its greatest beauty lies in the amazing regularity and elegance of its colours. In the male, they are white and brown; in the female, white and black. These colours are disposed in alternate stripes over the whole body, and with such exactness and symmetry, that one would think Nature had employed the rule and compass to paint them. These stripes, which, like so many ribands, are laid all over its body, are narrow, parallel, and exactly separated from each other. It is not here as in other party-coloured animals, where the tints are blended into each other; every stripe here is perfectly distinct, and preserves its colour round the body or the limb, without any diminution. In this manner are the head, the body, the thighs, the legs, and even the tail and the ears, beautifully streaked, so that at a little distance one would be apt to suppose that the animal was dressed out by art, and not thus admirably adorned by nature.

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[7] Mules have not unfrequently been known to bring forth young, especially in hot countries; and instances have not been wanting, though they are rare, both in England and Scotland. But it would require a succession of experiments to prove that mules will breed with each other, and produce an offspring equally capable of continuing the race. The common mule is very healthy and will live above thirty years. It is found very serviceable in carrying burdens, particularly in mountainous and stony places, where horses are not so sure-footed. The size and strength of our breed have lately been much improved by the exportation of Spanish male asses; and it were much to be wished that the useful qualities of this animal were more attended to; for, by proper care in its breaking, its natural obstinacy would, in a great measure, be corrected; and it might be formed with success for the saddle, the draught, or the burden. People of the first quality in Spain are drawn by mules, where fifty or sixty guineas is no uncommon price for one of them; nor is it surprising, when we consider how far they excel the horse in travelling in a mountainous country, the mule being able to tread securely where the former can hardly stand.—ED.

[8] Ulloa, vol. i.

[1] There are other two species of the horse genus, namely, the dziggtai and the quagga. The mountain-zebra, and the zebra of the plains, are also different species. See Supplementary Note to this chapter.—ED.

In the male zebra, the head is striped with fine bands of black and white, which in a manner centre in the forehead. The ears are variegated with a white and dusky brown. The neck has broad stripes of the same dark brown running round it, leaving narrow white stripes between. The body is striped also across the back with broad bands, leaving narrower spaces of white between them, and ending in points at the sides of the belly, which is white, except a black line pectinated on each side, reaching from between the fore-legs, along the middle of the belly, two-thirds of its length. There is a line of separation between the trunk of the body and the hinder quarters, on each side; behind which, on the rump, is a plat of narrow stripes, joined together by a stripe down the middle, to the end of the tail. The colours are different in the female; and in none the stripes seem entirely to agree in form, but in all they are equally distinct; the hair equally smooth and fine, the white shining and unmixed; and the black, or brown, thick and lustrous.

Such is the beauty of this creature, that it seems by nature fitted to satisfy the pride and the pleasure of man; and formed to be taken into his service. Hitherto, however, it appears to have disdained servitude; and neither force nor kindness have been able to wean it from its native independence and ferocity. But this wildness might, perhaps, in time be surmounted: and it is probable the horse and the ass, when first taken from the forest, were equally obstinate, fierce, and unmanageable. Mr. Buffon informs us, that the zebra, from which he took his description, could never be entirely mastered, notwithstanding all the efforts which were tried to tame it. They continued, indeed, to mount it, but then with such precautions as evidently showed its fierceness, for two men were obliged to hold the reins, while the third ventured upon its back; and even then it attempted to kick, whenever it perceived any person approaching. That which is now in the Queen's menagerie at Buckingham-Gate, is even more vicious than the former; and the keeper who shows it takes care to inform the spectators of its ungovernable nature. Upon my attempting to approach it, it seemed quite terrified, and was preparing to kick, appearing as wild as if just caught, although taken extremely young, and used with the utmost indulgence. Yet still it is most probable that this animal. by time and assiduity, could be brought under subjection. As it resembles the horse in form, without all doubt it has a similitude of nature, and only requires the efforts of an industrious and skilful nation, to be added to the number of our domestics. It is not *now* known what were the pains and dangers which were first undergone to reclaim the breed of horses from savage ferocity; these, no doubt, made an equal opposition; but by being opposed by an industrious and enterprising race of mankind, their spirit was at last subdued, and their freedom restrained. It is otherwise with regard to the zebra; it is the native of countries where the human inhabitants are but little raised above the quadruped. The natives of Angola, or Caffraria, have no other idea of advantage from horses but as they are good for food; neither the fine stature of the Arabian courser nor the delicate colourings of the zebra, have any allurements to a race of people, who only consider the quantity of flesh, and not its conformation. The delicacy of the zebra's shape, or the painted elegance of its form, are no more regarded by such, than by the lion that makes it his prey. For this reason, therefore, the zebra may hitherto have continued wild, because it is the native of a country where there have been no successive efforts made to reclaim it. All pursuits that have been hitherto instituted against it, were rather against its life than its liberty: the animal has thus been long taught to consider man as its most mortal enemy; and it is not to be wondered that it refuses to yield obedience where it has so seldom experienced mercy. There is a kind of knowledge in all animals, that I have often considered with amazement; which is, that they seem perfectly to know their enemies, and to avoid them. Instinct, indeed, may teach the deer to fly from the lion; or the mouse to avoid the cat; but what is the principle that teaches the dog to attack the dog-butcher wherever he sees him? In China, where the killing and dressing of dogs is a trade, whenever one of those people moves out, all the dogs of the village or the street are sure to be after him. This I should hardly have believed, but that I have seen more than one instance of it among ourselves. I have seen a poor fellow who made a practice of stealing and killing dogs for their skins, pursued in full cry for three or four streets together, by all the bolder breed of dogs, while the weaker flew from his presence with affright. How these animals could thus find out their enemy, and pursue him, appears, I own, unaccountable, but such is the fact; and it not only obtains in dogs, but in several other animals, though perhaps to a less degree. This very probably may have been in some measure a cause that has hitherto kept the zebra in its state of natural wildness; and in which it may continue, till kinder treatment shall have reconciled it to its pursuers.

It is very likely, therefore, as a more civilized people are now placed at the Cape of Good Hope, which is the chief place where this animal is found, that we may have them tamed and rendered serviceable. Nor is its extraordinary beauty the only motive we have for wishing this animal among the number of our dependents: its swiftness is said to surpass that of all others; so that the speed of a zebra is become a proverb among the Spaniards and Portuguese. It stands better upon its legs also than a horse; and is consequently stronger in proportion. Thus, if by proper care we improve the breed, as we have in other instances, we should probably in time to come have a race as large as the horse, as fleet, as strong, and much more beautiful.

The zebra, as was said, is chiefly a native of the Cape of Good Hope. It is also found in the kingdom of Angola; and, as we are assured by Lopez, in several provinces also of Barbary. In those boundless forests it has nothing to restrain its liberty; it is too shy to be caught in traps, and therefore seldom taken alive. It would seem, therefore, that none of them have ever been brought into Europe, that were caught sufficiently young, so as to be untinctured by their original state of wildness. The Portuguese, indeed, pretend that they have been able to tame them, and that they have sent four from Africa to Lisbon, which were so far brought under, as to draw the king's coach:[2] they add, that the person who sent them over, had the office of notary conferred upon him for his reward, which was to remain to him and his posterity for ever: but I do not find this confirmed by any person who says he saw them. Of those which were sent to Brazil, not one could be tamed; they would permit one man only to approach them; they were tied up very short; and one of them, which had by some means got loose, actually killed his groom, having bitten him to death.[3] Notwithstanding this, I believe, were the zebra taken up very young, and properly treated, it might be rendered as tame as another animal; and Merolla, who saw many of them, asserts, that when tamed, which he speaks of as being common enough, they are not less estimable for their swiftness than their beauty.

This animal, which is neither to be found in Europe, Asia, nor America, is nevertheless very easily fed. That which came over into England some years ago, would eat almost any thing, such as bread, meat, and tobacco; that which is now among us, subsists entirely upon hay. As it so nearly resembles the horse and the ass in structure, so it probably brings forth annually as they do. The noise they make is neither like that of a horse nor an ass, but more resembling the confused barking of a mastiff dog. In the two which I saw, there was a circumstance that seems to have escaped naturalists; which is, that the skin hangs loose below the jaw upon the neck, in a kind of dewlap, which takes away much from the general beauty. But whether this be a natural or accidental blemish, I will not take upon me to determine.

These animals are often sent as presents to the princes of the East. We are told, that one of the governors of Batavia gave a zebra, which had been sent to him from Africa, to the emperor of Japan, for which he received, as an equivalent for the company, a present, to the value of sixty thousand crowns.[4] Teller also relates, that the Great Mogul gave two thousand ducats for one of them. And it is frequent with the African ambassadors to the court of Constantinople, to bring some of these animals with them, as presents for the Grand Signior.

NOTE.—*The Dziggtai and the Quagga.*

The specific characters of the dziggtai are:—His skin is isabella, or light bay in summer, and of a clean and thriving appearance. In winter it is of a redder hue, and the hair is very long. His mane and dorsal line, which enlarges on the crupper, are generally black; and his tail is terminated by a black tuft. He is generally the size of an ordinary wild horse; and his proportions are intermediate between the horse and the ass. He is probably the wild mule of the ancients, and lives in troops in the sandy deserts of Central Asia. Messerschmit was the first who noticed this animal; but we had no precise description till it was given by Pallas. His name in the Mongol language signifies 'large ear.' His ears are much longer than those of the horse, but straighter and better formed than those of the mule. His head is strong and rather heavy; the forehead narrow and flattened, with a peculiar projection above the nostrils, whence the nose suddenly droops. The bristles or beard are numerous, and about two-and-a-half inches in length; the mane is short and thick; the chest capacious; the back long and curved; and the crupper somewhat thin. The shoulders are narrow, and the limbs light; the pasterns are long, with hoofs like those of the ass; the tail resembles that of a bull, very thick at its base, black, and nearly two feet long, with a thick tuft at its point reaching nearly three inches beyond his hock. The dziggtai is a light and nimble animal; his limbs beautifully fine, with flat shank-bones. The knee-joints are long and straight, and peculiarly formed for speed, which he possesses in an astonishng degree. His air betrays extreme energy, being wild, fiery, and untameable in his disposition.

The head and neck of the quagga are dark blackish brown, the rest of the body is of a clear brown, growing paler below, and underneath nearly white. The head and neck are striped with grayish white, longitudinally on the forehead and temples, and transversely on the cheeks. Between the mouth and eyes these stripes form triangles. There are ten bands on the neck; the mane is blackish and short, and much thicker than that of the zebra. A longitudinal black band runs from the termination of the mane along the spine, and loses itself in the tail, which is like that of a cow, with a dark brown or black tuft of hair at its extremity. The height of the quagga, or couagga, is about four feet, or twelve hands, at the withers. In his form, proportions, lightness of figure, and smallness of head and ears, he bears a greater resemblance to the horse than the zebra, but his tail is like that of a cow. Quaggas associate in herds, frequently to the number of one hundred, in the most solitary regions of Southern Africa. But they are never to be found in company with zebras, the species to which they are most nearly allied in general conformation. The cry of this animal bears a strong resemblance to the barking of a dog, and is particularly sharp in the rutting-season. He is easily tamed, and rendered obedient to domestic purposes. In a wild state the quagga is possessed of great natural courage; for he effectually repels the attacks of wolves and hyænas. The late Earl of Morton succeeded in engendering mules between a male quagga and a mare. They were not, however, handsome animals.

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[2] Dapper.

[3] Pyrard. tom. ii. p. 376.

[4] Navendorf.

The zebra of the plains was first ascertained by Mr. Burchell to be different from the common or mountain-zebra. The following is Mr. Gray's specific description of the zebra of the plains:—"Body white; head with numerous narrow brown stripes, which gradually unite together and form a bay nose, the neck and body with alternate broad stripes of black and narrow ones of brown, the latter of which nearly fill up the interstices between the black stripes, and only leave a narrow whitish margin. The dorsal line is narrow, and becomes gradually broader in the hinder part, distinctly margined with white on each side. The belly, legs, and all, quite white; the mane alternately banded with black and white." This beautiful animal differs materially from the common zebra; the ground colour of his body being entirely white, interrupted by a regular series of black stripes commencing on the ridge of the back, and terminating at the bottom of his sides. Betwixt these are narrower and fainter ones of a brownish colour. On the shoulders and over the haunches, these stripes assume somewhat of a bifurcated appearance, between the divisions of which there are a few transverse lines of the same colour; but these suddenly and abruptly disappear, and are not continued on the legs, as in the common zebra. Along the spinal ridge there is a narrow longitudinal line bordered on each side with white. The mane is long, stiff, and erect, with the transverse bands of the neck broadly continued through it, and distinctly tipped with deep black. The lines of the face are narrow, and perfectly regular; from the centre of the forehead they radiate downwards over each eye; along the front of the muzzle they are longitudinal, with the outer ones slighty curved outwards; and on the sides they form broader transverse fillets. From where the bands unite on the extremity of the muzzle, the nose, and the upper lip, those parts become nearly of a uniform blackish brown. The tail is of a yellowish white. There is no longitudinal ventral line; and the back part of the ears is occupied towards the tips by patches of black. The hoofs are moderately large, deep in front, and shallow behind, and considerably expanded at their margin.

BOOK III.

OF RUMINATING ANIMALS.

CHAP. I.

INTRODUCTION.

Of all animals, those that chew the cud are the most harmless, and the most easily tamed. As they live entirely upon vegetables, it is neither their interest nor their pleasure to make war upon the rest of the brute creation; content with the pastures where they are placed, they seldom desire to change, while they are furnished with a proper supply; and fearing nothing from each other, they generally go in herds for their mutual security. All the fiercest of the carnivorous kinds seek their food in gloomy solitude; these, on the contrary, range together; the very meanest of them are found to unite in each other's defence; and the hare itself is a gregarious animal, in those countries where it has no other enemies but the beasts of the forest to guard against.

As the food of ruminant animals is entirely of the vegetable kind, and as this is very easily procured, so these animals seem naturally more indolent and less artful than those of the carnivorous kinds; and as their appetites are more simple, their instincts seem to be less capable of variation. The fox or the wolf are for ever prowling; their long habits of want give them a degree of sharpness and cunning; their life is a continued scene of stratagem and escape; but the patient ox, or the deer, enjoy the repast that nature has abundantly provided; certain of subsistence, and content with security.

As nature has furnished these animals with an appetite for such coarse and simple nutriment, so she has enlarged the capacity of the intestines, to take in a greater supply. In the carnivorous kinds, as their food is nourishing and juicy, their stomachs are but small, and their intestines short; but in these, whose pasture is coarse, and where much must be accumulated before any quantity of nourishment can be obtained, their stomachs are large and numerous, and their intestines long and muscular. The bowels of a ruminating animal may be considered as an elaboratory, with vessels in it, fitted for various transmutations. It requires a long and tedious process before grass can be transmuted into flesh; and for this purpose, nature, in general, has furnished such animals as feed upon grass with four stomachs, through which the food successively passes and undergoes the proper separations.[1]

Of the four stomachs with which ruminant animals are furnished, the first is called the *paunch*, which receives the food after it has been slightly chewed; the second is called the *honey-comb*, and is properly nothing more than a continuation of the former; these two, which are very capacious, the animal fills as fast as it can, and then lies down to ruminate; which may be properly considered as a kind of vomiting without effort or pain. The two stomachs above mentioned being filled with as much as they can contain, and the grass, which was slightly chewed, beginning to swell with the heat of the situation, it dilates the stomachs, and these again contract upon their contents. The aliment, thus squeezed, has but two passages to escape at; one into the third stomach, which is very narrow; and the other back, by the gullet, into the mouth, which is wider. The greatest quantity, therefore, is driven back, through the largest aperture, into the mouth to be chewed a second time; while a small part, and that only the most liquid, is driven into the third stomach, through the orifice which is so small. The food which is driven to the mouth, and chewed a second time, is thus rendered more soft and moist, and becomes at last liquid enough to pass into the conduit that goes to the third stomach, where it undergoes a still farther comminution. In this stomach, which is called the *manifold*, from the number of its leaves, all which tend to promote digestion, the grass has the appearance of boiled spinnage, but not yet sufficiently reduced, so as to make a part of the animal's nourishment; it requires the operation of the fourth stomach for this purpose, where it undergoes a complete maceration, and is separated to be turned into chyle.

But nature has not been less careful in another respect, in fitting the intestines of these animals for their food. In the carnivorous kinds they are thin and lean; but in ruminating animals they are strong, fleshy, and well covered with fat. Every precaution seems taken that can help their disgestion; their stomach is strong and muscular, the more readily to act upon its contents; their intestines are lined with fat, the better to preserve their warmth; and they are extended to a much greater length, so as to extract every part of that nourishment which their vegetable food so scantily supplies.

In this manner are all quadrupeds of the cow, the sheep, or the deer kind, seen to ruminate; being thus furnished with four stomachs for the macerating of their food. These, therefore, may most properly be called the *ruminant kinds;* although there are many others that have this quality in a less observable degree. The rhinoceros, the camel, the horse, the rabbit, the marmotte, and the squirrel, all chew the cud by intervals, although they are not furnished with stomachs like the former. But not these alone, there are numberless other animals that appear to ruminate; not only birds but fishes and insects. Among birds are the pelican, the stork, the heron, the pigeon, and the turtle: these have a power of disgorging their food to feed their young. Among fishes are lobsters, crabs, and that fish called the *dorado*. The salmon also is said to be of this number: and, if we may believe Ovid, the *scarus* likewise; of which he says,[2]

> Of all the fish that graze beneath the flood,
> He *only* ruminates his former food.

Of insects, the ruminating tribe is still larger; the mole, the cricket, the wasp, the drone, the bee, the grasshopper, and the beetle. All these animals either actually chew the cud, or seem at least to ruminate. They have the stomach composed of muscular fibres, by means whereof the food is ground up and down, in the same manner as in those which are particularly distinguished by the appellation of *ruminants*.

But not these alone; men themselves have been often known to ruminate, and some even with pleasure. The accounts of these calamities, for such I must consider them, incident to our fellow-creatures, are not very pleasant to read: yet I must transcribe a short one, as given us by Slare, in the Philosophical Transactions, as it may, in some measure, show the satisfaction which the lower tribes of animals enjoy while they ruminate. The man in question was a citizen of Bristol, of about twenty years of age, and, what seemed more extraordinary still, of a ruminating family, for his father was frequently subject to the same infirmity, or amusement, as he himself perhaps would call it. This young man usually began to chew his meat over again within about a quarter of an hour after eating. His ruminating after a full meal generally lasted about an hour and a half; nor could he sleep until this task was performed. The victuals, upon the return, tasted even more pleasantly than at first; and returned as if they had been beaten up in a mortar. If he ate a variety of things, that which he ate first came up again first; and if this return was interrupted for any time, it produced sickness and disorder, and he was never well till it returned. Instances of this kind, however, are rare and accidental; and it is happy for mankind that they are so. Of all other animals, we spend the least time in eating; this is one of the great distinctions between us and the brute creation; and eating is a pleasure of so low a kind, that none but such as are nearly allied to the quadruped desire its prolongation.

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[1] All quadrupeds that chew the cud have suet instead of the soft fat of other animals; and they have the awkward habit of rising, when in a recumbent posture, upon their hind legs first. A cow, when she rises from the ground, places herself on the fore-knees, and then lifts up the whole hinder parts. A horse springs up first on his fore-legs, and then raises up his hinder parts. This may be owing to the different conformation of the stomach.—ED.

[2] At contra herbosa pisces laxantur arena,
Ut scarus epastus *solus* qui ruminant escas.

CHAP. II.

OF QUADRUPEDS OF THE COW KIND.

Of all ruminant animals, those of the cow kind[1] deserve the first rank, both for their size, their beauty and their services. The horse is more properly an animal belonging to the rich; the sheep chiefly thrives in a flock, and requires attendance; but the cow is more especially the poor man's pride, his riches, and his support. There are many of our peasantry that have no other possession but a cow; and even of the advantages resulting from this most useful creature, the poor are but the nominal possessors. Its flesh they cannot pretend to taste, since then their whole riches are at once destroyed; its calf they are obliged to fatten for sale, since veal is a delicacy they could not make any pretensions to; its very milk is wrought into butter and cheese for the tables of their masters; while they have no share, even in their own possession, but the choice of their market. I cannot bear to hear the rich crying out for liberty while they thus starve their fellow-creatures, and feed them up with an imaginary good, while they monopolize the real benefits of nature.

In those countries where the men are under better subordination, this excellent animal is of more general advantage. In Germany, Poland, and Switzerland, every peasant keeps two or three cows, not for the benefit of his master, but for himself. The meanest of the peasants there kills one cow at least for his own table, which he salts and hangs up, and thus preserves as a delicacy all the year round. There is scarcely a cottage in those countries that is not hung round with these marks of hospitality; and which often make the owner better contented with hunger, since he has it in his power to be luxurious when he thinks proper. A piece of beef hung up there is considered as an elegant piece of furniture, which, though seldom touched, at least argues the possessor's opulence and ease. But it is very different, for some years past, in this country, where our lower rustics at least are utterly unable to purchase meat any part of the year, and by them even butter is considered as an article of extravagance.

The climate and pasture of Great Britain, however, are excellently adapted to this animal's moderate nature; and the verdure and the fertility of our plains are perfectly suited to the manner of its feeding; for wanting the upper fore-teeth, it loves to graze in a high rich pasture. This animal seems but little regardful of the quality of its food, provided it be supplied in sufficient abundance; it makes no particular distinction in the choice of its herbage, but indiscriminately and hastily devours the proper quantity. For this reason, in our pastures, where the grass is rather high than succulent, more flourishing than nutritious, the cow thrives admirably; and there is no part of Europe where the tame animal grows larger, yields more milk, or more readily fattens, than with us.

Our pastures supply them with abundance, and they in return enrich the pasture; for, of all animals, the cow seems to give back more than it takes from the soil. The horse and the sheep are known, in a course of years, to impoverish the ground. The land where they have fed becomes weedy, and the vegetables coarse and unpalatable; on the contrary, the pasture where the cow has been bred, acquires a finer, softer surface, and becomes every year more beautiful and even. The reason is, that the horse being furnished with fore-teeth in the upper jaw, nips the grass closely, and therefore only chooses that which is the most delicate and tender; the sheep also, though, with respect to its teeth, formed like the cow, only bites the most succulent parts of the herbage: these animals, therefore, leave all the high weeds standing; and while they cut the finer grass too closely, suffer the ranker herbage to vegetate and overrun the pasture. But it is otherwise with the cow: as its teeth cannot come so close to the ground as those of the horse, nor so readily as those of the sheep, which are less, it is obliged to feed upon the tallest vegetables that offer; thus it eats them all down, and in time, levels the surface of the pasture.

The age of the cow is known by the teeth and horns. This animal is furnished with eight cutting teeth in the lower jaw; at the age of ten months the two middlemost of these fall out, and are replaced by others that are not so white, but broader; at the age of sixteen months the two next milk-white teeth fall out likewise, and others come up in their room; thus, at the end of every six months, the creature loses and gains, till at the age of three years all the cutting-teeth are renewed, and then they are long, pretty white, and equal; but in proportion as the animal advances in years, they become irregular and black, their inequalities become smoother, and the animal less capable of chewing its food. Thus the cow often declines from this single cause; for as it is obliged to eat a great deal to support life, and as the smoothness of the teeth makes the difficulty of chewing great, a sufficient quantity of food cannot be supplied to the stomach. Thus the poor animal sinks in the midst of plenty, and every year grows leaner and leaner, till it dies.

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[1] The animals of this kind have the horns hollow, smooth, turned outwards and forwards, in a semicircular form; in the lower jaw there are eight front teeth, but none in the upper: and there are no tusks in either.—Ed.

The horns are another and a surer method of determining this animal's age. At three years old it sheds its horns,[2] and new ones arise in their place which continue as long as it lives; at four years of age, the cow has small pointed, neat, smooth horns, thickest near the head; at five, the horns become larger, and are marked round with the former year's growth. Thus, while the animal continues to live, the horns continue to lengthen; and every year a new ring is added at the root; so that allowing three years before their appearance, and then reckoning the number of rings, we have, in both together, the animal's age exactly.

As we have indisputably the best breed of horned cattle of any in Europe, so it was not without the same assiduity that we came to excel in these, as in our horses. The breed of cows has been entirely improved by a foreign mixture properly adapted to supply the imperfections of our own. Such as are purely British are far inferior in size to those on many parts of the continent; but those which we have thus improved by far excel all others. Our Lincolnshire kind derive their size from the Holstein breed: and the large hornless cattle that are bred in some parts of England came originally from Poland. We were once famous for a wild breed of these animals, but these have long since been worn out; and perhaps no kingdom in Europe can furnish so few wild animals of all kinds as our own. Cultivation and agriculture are sure to banish these wherever they are found; and every addition a country receives from art drives away those animals that are only fitted for a state of nature.

Of all quadrupeds the cow seems most liable to alteration from its pasture. In the different parts of our own country we easily perceive the great varieties produced among these animals, by the richness or poverty of the soil. In some they grow to a great bulk; and I have seen an ox sixteen hands high, which is taller than the general run of our horses. In others they appear as diminutive; being not so large as an ass. The breed of the Isle of Man, and most parts of Scotland, is much less in general than in England or Ireland: they are differently shaped also, the dewlap being much smaller, and, as the expression is, the beast has more of the ewe neck. This, till some years ago, was considered in cattle as a deformity; and the cow was chosen according to Virgil's direction, with a large dewlap: however, at present it is the universal opinion, that the cow wants in udder what it has in neck; and the larger the dewlap, the smaller is the quantity of its milk. Our graziers now, therefore, endeavour to mix the two breeds; the large Holstein with the small northern; and from both results that fine milch breed, which excels the cattle of any other part of the world.

This difference, arising from pasture, is more observable in other countries than in our own. The cow kind is to be found in almost every part of the world, large in proportion to the richness of the pasture; and small as the animal is stinted in its food.[3] Thus Africa is remarkable for the largest and the smallest cattle of this kind; as is also India, Poland, Switzerland, and several other parts of Europe. Among the Eluth Tartars, where the pastures are remarkably rich and nourishing, the cow becomes so large that he must be a tall man who can reach the tip of its shoulder. On the contrary, in France, where the animal is stinted in its food, and driven from the most flourishing pastures, it greatly degenerates.

But the differences in the size of this animal are not so remarkable as those which are found in its form, its hair, and its horns. The difference is so very extraordinary in many of them, that they have been considered as a different kind of creature, and names have been given them as a distinct species, when in reality they are all the same.[4] In this manner the urus and the bison have been considered, from the variety in their make, to be distinct in their production; but they are all, in fact, the descendants of one common stock, as they have that certain mark of unity, they breed and propagate among each other. Naturalists have, therefore, laboured under an obvious error, when, because of the extreme bulk of the urus, or because of the hump upon the back of the bison, they assigned them different places in the creation, and separated a class of animals which was really united. It is true, the horse and the ass do not differ so much in form, as the cow and the bison; nevertheless, the former are distinct animals, as their breed is marked with sterility; the latter are animals of the same kind, as their breed is fruitful, and a race of animals is produced, in which the hump belonging to the bison is soon worn away. The differences, therefore, between the cow, the urus, and the bison, are merely accidental. The same caprice in nature that has given horns to some cows and denied them to others, may also have given the bison a hump, or increased the bulk of the urus; it may have given the one a mane, or denied a sufficiency of hair to the other.

But before we proceed farther, it may be proper to describe these varieties, which have been thus taken for distinct kinds.[5] The urus, or wild bull, is chiefly to be met with in the province of Lithuania; and grows to a size that scarcely any other animal, except the elephant, is found to equal. It is quite black, except a stripe mixed with white, that runs from the neck to the tail, along the top of the back; the horns are short, thick, and strong; the eyes are fierce and fiery; the forehead is adorned with a kind of garland of black curled hair, and some of them are found to have beards of the same; the neck is short and strong; and the skin has an odour of musk. The female, though not so big as the male, exceeds the largest of our bulls in size; nevertheless, her udder and teats are so small, that they can scarcely be perceived. Upon the whole, however, this animal resembles the tame one very exactly, except in some trifling varieties, which his state of wildness, or the richness of the pastures where he is found, may easily have produced.[6]

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[2] This is a mistake. The horns are not cast; but at the age of three years, the animal rubs off a very slight external shell coating from them.—ED.

[3] See Supplementary Note A, p. 295.

[4] Buffon, vol. xxiii. p. 78.

[5] This description is chiefly taken from Klein

The bison, which is another variety of the cow kind, differs from the rest, in having a lump between its shoulders. These animals are of various kinds; some very large, others as diminutively little. In general, to regard this animal's fore-parts, he has somewhat the look of a lion, with a long shaggy mane, and a beard under his chin; his head is little, his eyes red and fiery, with a furious look; the forehead is large, and the horns so big, and so far asunder, that three men might often sit between them. On the middle of the back there grows a bunch almost as high as that of a camel, covered with hair, and which is considered as a great delicacy by those that hunt him. There is no pursuing him with safety, except in forests where there are trees large enough to hide the hunters. He is generally taken by pitfalls: the inhabitants of those countries where he is found wild, digging holes in the ground, and covering them over with boughs of trees and grass; then provoking the bison to pursue them, they get on the opposite side of the pitfall, while the furious animal, running head foremost, falls into the pit prepared for him, and is there quickly overcome and slain.

Besides these real distinctions in the cow kind, there have been many others made, that appear to be in name only. Thus, the bonasus, of which naturalists have given us long descriptions, is supposed by Klein and Buffon to be no more than another name for the bison, as the descriptions given of them by the ancients coincide. The bubalus also of the ancients, which some have supposed to belong to the cow kind, Buffon places among the lower class of ruminant quadrupeds, as it most resembles them in size, shape, and the figure of its horns. Of all the varieties, therefore, of the cow kind, there are but two that are really distinct; namely, the cow and the buffalo: these two are separated by nature; they seem to bear an antipathy to each other; they avoid each other, and may be considered as much removed as the horse is from the ass or the zebra. When, therefore, we have described the varieties of the cow kind, we shall pass on to the buffalo, which, being a different animal, requires a separate history.

There is scarcely a part of the world, as was said before, in which the cow is not found in some one of its varieties; either large, like the urus, or humped, as the bison; with straight horns, or bending, inverted backwards, or turned sideways to the cheek, like those of the ram; and, in many countries, they are found without any horns whatsoever. But, to be more particular, beginning at the north, the few kine which subsist in Iceland, are without horns, although of the same race originally with ours. The size of these is rather relative to the goodness of the pasture, than the warmth or coldness of the climate. The Dutch frequently bring great quantities of lean cattle from Denmark, which they fatten on their own rich grounds. These are in general of a larger size than their own natural breed; and they fatten very easily. The cattle of the Ukraine, where the pasture is excellent, become very fat, and are considered as one of the largest breeds of Europe. In Switzerland, where the mountains are covered with a rich nourishing herbage, which is entirely reserved for their kine, these animals grow to a very large size. On the contrary, in France, where they get no other grass but what is thought unfit for horses, they dwindle and grow lean. In some parts of Spain the cow grows to a good size; those wild bulls, however, which they pride themselves so much in combating, are a very mean despicable little animal, and somewhat shaped like one of our cows, with nothing of that peculiar sternness of aspect for which our bulls are remarkable. In Barbary, and the provinces of Africa, where the ground is dry, and the pasturage short, the cows are of a very small breed, and give milk in proportion. On the contrary, in Ethiopia, they are of a prodigious bigness. The same holds in Persia and Tartary; where, in some places, they are very small, and, in others, of an amazing stature. It is thus, in almost every part of the world, this animal is found to correspond in size to the quantity of its provision.

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[6] The White urus (Urus Scoticus) is a wild breed of the ox, the probable remains of the genuine urus. It is of a small size, and ranged formerly through the woods of southern Scotland, and the north of England. When this breed was exterminated from the open forests is unknown; but some time before the Reformation, the remnants were already confined in parks belonging to ecclesiastical establishments, from whence they were transferred at the dissolution to that of Drumlanrig, and other places. Those in the park of Burton-Constable were all destroyed in the middle of the last century by a distemper. The race is entirely of a white colour; the muzzle invariably black; the inside of the ear, and about one-third part of the outside, from the tip downwards, red. The horns are white with black tips of a fine texture, and as in the fossil skull, bent downwards. Bulls weigh from thirty-five to forty-five stone, and cows from twenty-five to thirty-five stone, of fourteen pounds to the stone. Before they were kept in parks, they were probably larger and more rugged. Old bulls still acquire a kind of mane about two inches long, and their throat and breast is covered with coarser hair. Those at Burton-Constable differed from the others, in having the ears and tips of the tail black. Their manners differ from domestic oxen, and may be in part those of the ancient urus. Upon perceiving a stranger they gallop wildly in a circle round him, and stop to gaze, tossing their heads, and showing signs of defiance: they then set off, and gallop a second time round, but in a contracted circle, repeating this circular mode of approaching till they are so near, that it becomes prudent to retire from their intended charge. The cows conceal their young calves for eight or ten days, going to suckle them twice or three times in a day: if a person comes near the calf it conceals itself by crouching. Herds of these fine cattle are kept at Chillingham-Castle, the property of the Earl of Tankerville, near Berwick-upon-Tweed; at Wallaton, in Nottingham; at Gisburn, in Craven; at Limehall, in Cheshire; at Chartley, in Staffordshire; and in the Duke of Hamilton's park in Lanarkshire.—Ed.

If we examine the form of these animals, as they are found tame, in different regions, we shall find, that the breed of the urus, or those without a hump, chiefly occupies the cold and the temperate zones, and is not so much dispersed towards the south. On the contrary, the breed of the bison, or the animal with a hump, is found in all the southern parts of the world, throughout the vast continent of India; throughout Africa, from mount Atlas to the Cape of Good Hope. In all these countries, the bison seems chiefly to prevail; where they are found to have a smooth soft hair, are very nimble of foot, and in some measure supply the want of horses. The bison breed is also more expert and docile than ours; many of them, when they carry burdens, bend their knees to take them up, or set them down: they are treated, therefore, by the natives of those countries, with a degree of tenderness and care equal to their utility; and the respect for them in India has degenerated even into blind adoration. But it is among the Hottentots where these animals are chiefly esteemed, as being more than commonly serviceable. They are their fellow-domestics, the companions of their pleasures and fatigues; the cow is at once the Hottentot's protector and servant, assists him in attending his flocks and guarding them against every invader: while the sheep are grazing, the faithful backely, as this kind of cow is called, stands or grazes beside them; still, however, attentive to the looks of its master, the backely flies round the field, herds in the sheep that are straying, obliges them to keep within proper limits, and shows no mercy to robbers, or even strangers, who attempt to plunder. But it is not the plunderers of the flock alone, but even the enemies of the nation, that these backelies are taught to combat. Every army of Hottentots is furnished with a proper herd of these, which are let loose against the enemy, when the occasion is most convenient. Being thus sent forward, they overturn all before them; they strike every opposer down with their horns, and trample upon them with their feet; and thus often procure their masters an easy victory, even before they have attempted to strike a blow. An animal so serviceable, it may be supposed, is not without its reward. The backely lives in the same cottage with its master, and, by long habit, gains an affection for him; and in proportion as the man approaches to the brute, so the brute seems to attain even to some share of human sagacity. The Hottentot and his backely thus mutually assist each other; and when the latter happens to die, a new one is chosen to succeed him, by a counsel of the old men of the village. The new backely is then joined with one of the veterans of his own kind, from whom he learns his art, becomes social and diligent, and is taken for life into human friendship and protection.

The bisons, or cows with a hump, are found to differ very much from each other in the several parts of the world where they are found.[7] The wild ones of this kind, as with us, are much larger than the tame. Some have horns, and some are without any; some have them depressed, and some raised in such a manner that they are used as weapons of annoyance or defence; some are extremely large, and others among them, such as the zebu, or Barbary cow, are very small. They are all, however, equally docile and gentle when tamed; and, in general, furnished with a fine lustrous soft hair, more beautiful than that of our own breed; their hump is also of different sizes, in some weighing from forty to fifty pounds, in others less; it is not, however, to be considered as a part necessarily belonging to the animal; and probably it might be cut away without much injury: it resembles a gristly fat; and, as I am assured, cuts and tastes somewhat like a dressed udder. The bisons of Malabar, Abyssinia, Madagascar, are of the great kind, as the pastures there are plentiful. Those of Arabia Petræa, and most parts of Africa, are small, and of the zebu or little kind. In America, especially towards the north, the bison is well known. The American bison, however, is found to be rather less than that of the ancient continent; its hair is longer and thicker, its beard more remarkable, and its hide more lustrous and soft. There are many of them brought up tame in Carolina; however, their wild dispositions still seem to continue, for they break through all fences to get into the corn-fields, and lead the whole tame herd after them, wherever they penetrate. They breed also with the tame kinds originally brought over from Europe; and thus produce a race peculiar to that country.

From all this it appears,[8] that naturalists have given various names to animals in reality the same, and only differing in some few accidental circumstances. The wild cow and the tame, the animal belonging to Europe, and that of Asia, Africa, and America, the bonasus and the urus, the bison and the zebu, are all one and the same, propagate among each other, and, in the course of a few generations, the hump wears away, and scarcely any vestiges of savage fierceness are found to remain. Of all animals, therefore, except man alone, the cow seems most extensively propagated. Its nature seems equally capable of the rigours of heat and cold. It is an inhabitant as well of the frozen fields of Iceland, as the burning deserts of Libya. It seems an ancient inmate in every climate, domestic and tame in those countries which have been civilized, savage and wild in the countries which are less peopled, but capable of being made useful in all; able to defend itself in a state of nature against the most powerful enemy of the forest; and only subordinate to man, whose force it has experienced, and whose aid it at last seems to require. However wild the calves are, which are taken from the dam in a savage state, either in Africa or Asia, they soon become humble, patient, and familiar; and man may be considered in those countries as almost helpless without their assistance. Other animals preserve their nature or their form with inflexible perseverance; but these, in every respect, suit themselves to the appetites and conveniences of mankind; and as their shapes are found to alter, so also does their nature; in no animal is there seen a greater variety of kinds, and in none a more humble and pliant disposition.

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[7] See Supplementary Note B, p. 296.

[8] Buffon, vol. xxiii. p. 130.

THE BUFFALO.

If we should compare the shape of our common cow with that of the bison, the difference will appear very great. The shaggy mane of the latter, the beard, the curled forehead, the inverted horns, the broad breast, and the narrow hinder parts, give it the appearance rather of a lion than a cow; and fit it more for a state of war with mankind than a state of servitude. Yet notwithstanding these appearances, both animals are found to be the same; or at least so nearly allied that they breed among each other, and propagate a race that continues the kind.[9]

On the other hand, if we compare the buffalo with our common cow, no two animals can be more nearly alike, either in their form or their nature; both equally submissive to the yoke, both often living under the same roof, and employed in the same domestic services; the make and the turn of their bodies so much alike, that it requires a close attention to distinguish them: and yet, after all this, no two animals can be more distinct, or seem to have greater antipathies to each other.[10] Were there but one of each kind remaining, it is probable the race of both would shortly be extinct. However, such is the fixed aversion formed between these creatures, that the cow refuses to breed with the buffalo, which it nearly resembles; while it is known to propagate with the bison, to which it has, in point of form, but a very distant similitude.

The buffalo is, upon the whole, by no means so beautiful a creature as the cow; his figure is more clumsy and awkward; his air is wilder; and he carries his head lower, and nearer the ground; his limbs are less fleshy, and his tail more naked of hair; his body is shorter and thicker than that of the cow kind; his legs are higher; his head smaller; his horns not so round, black, and compressed, with a bunch of curled hair hanging down between them; his skin is also harder and thicker, more black, and less furnished with hair; his flesh, which is hard and blackish, is not only disagreeable to the taste but likewise to the smell. The milk of the female is by no means so good as that of the cow; it is however produced in great abundance. In the warm countries almost all their cheese is made of the milk of the buffalo; and they supply butter also in large quantities. The veal of the young buffalo is not better eating than the beef of the old. The hide of this animal seems to be the most valuable thing he furnishes. The leather made of it is well known for its thickness, softness, and impenetrability. As these animals are, in general, larger and stronger than the cow, they are usefully employed in agriculture. They are used in drawing burdens, and sometimes in carrying them; being guided by a ring, which is thrust through their nose. Two buffaloes yoked in a waggon, are said to draw more than four strong horses; as their heads and necks are naturally bent downward, they are thus better fitted for the draught, and the whole weight of their bodies is applied to the carriage that is to be drawn forward.

From the size and bulk of the buffalo, we may be easily led to conclude that he is a native of the warmer climates. The largest quadrupeds are generally found in the torrid zone; and the buffalo is inferior in point of size only to the elephant, the rhinoceros, or the hippopotamus. The camelopard or the camel may indeed be taller, but they are neither so long, nor near so corpulent. Accordingly, we find this animal wild in many parts of India; and tamed also wherever the natives have occasion for his services. The wild buffaloes are very dangerous animals, and are often found to gore travellers to death, and then trample them with their feet, until they have entirely mangled the whole body: however, in the woods they are not so much to be feared as in the plains, because in the violence of their pursuit their large horns are apt to be entangled in the branches of the trees, which gives those who have been surprised by them time to escape the danger. There is scarcely any other method of avoiding their pursuit; they run with great swiftness; they overturn a tree of moderate growth; and are such swimmers, as to cross the largest rivers without any difficulty. In this manner, like all other large animals of the torrid zone, they are very fond of the water; and in the midst of their pursuit, often plunge in, in order to cool themselves. The negroes of Guinea, and the Indians of Malabar, where buffaloes are in great abundance, take great delight in hunting and destroying them: however, they never attempt to face the buffalo openly; but generally climbing up the tree, shoot at him from thence, and do not come down till they find they have effectually despatched him. When they are tamed, no animal can be more patient or humble; and though by no means so docile as the cow kind, yet they go through domestic drudgeries with more strength and perseverance.

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[9] See Supplementary Note C, p. 298.

[10] Buffon.

Although these animals be chiefly found in the torrid zone, yet they are bred in several parts of Europe, particularly in Italy, where they make the food and the riches of the poor. The female produces but one at a time, in the same manner as the cow; but they are very different in the times of gestation; for the cow, as we know, goes but nine months; whereas the buffalo continues pregnant for twelve. They are all afraid of fire; and, perhaps, in consequence of this, have an aversion to red colours that resemble the colour of flame; it is said that in those countries where they are found in plenty, no person dares to dress in scarlet. In general they are inoffensive animals, if undisturbed; as indeed all those which feed upon grass are found to be; but when they are wounded, or when even but fired at, nothing then can stop their fury; they then turn up the ground with their forefeet, bellow much louder and more terribly than the bull, and make at the object of their resentment with ungovernable rage. It is happy, in such circumstances, if the person they pursue has a wall to escape over, or some such obstacle; otherwise they soon overtake, and instantly destroy him. It is remarkable, however, that although their horns are so very formidable, they in general make more use of their feet in combat, and rather tread their enemies to death than gore them.

Having thus gone through the history of these animals, it may be proper to observe, that no names have been more indiscriminately used than those of the bull, the urus, the bison, and the buffalo. It therefore becomes such as would have distinct ideas of each to be careful in separating the kinds, the one from the other, allowing the cow for the standard of all The urus, whether of the large enormous kind of Lithuania or the smaller race of Spain, whether with long or short horns, whether with or without long hair in the forehead, is every way the same with what our common breed was before they were taken from the forest, and reduced to a state of servitude. The bison and all its varieties, which are known by a hump between the shoulders, is also to be ranked in the same class. This animal, whether with crooked or straight horns, whether they be turned towards the cheek, or totally wanting, whether it be large or diminutive, whatever be its colour, or whatever the length of its hair, whether called the *bonasus* by some, or the *bubalus* by others, is but a variety of the cow kind, with whom it breeds, and with whom of consequence it has the closest connexion. Lastly, the buffalo, though shaped much more like the cow, is a distinct kind by itself, that never mixes with any of the former; that goes twelve months with young, whereas the cow goes but nine; that testifies an aversion to the latter; and, though bred under the same roof, or feeding in the same pasture, has always kept separate; and makes a distinct race in all parts of the world. These two kinds are supposed to be the only real varieties in the cow kind, of which naturalists have given so many varieties. With respect to some circumstances mentioned by travellers, such as that of many kinds defending themselves, by voiding their dung against their pursuers; this is a practice which they have in common with other timid creatures when pursued, and arises rather from fear than a desire of defence. The musky smell also by which some have been distinguished, is found common to many of these kinds, in a state of nature; and does not properly make the characteristic marks of any. The particular kind of noise also, which some of them are known to make, which rather resembles grunting than bellowing or lowing, is but a savage variety, which many wild animals have, and yet lose when brought into a state of tameness. For these reasons, Mr. Buffon, whom I have followed in this description, is of opinion, that the zebu, or little African cow, and the grunting, or Siberian cow, are but different races of the bison; as the shape of the horns, or the length of the hair, are never properly characteristic marks of any animal, but are found to vary with climate, food, and cultivation.

In this manner the number of animals of the cow kind, which naturalists have extended to eight or ten sorts, are reduced to two; and as the utmost deference is paid to the opinion of Mr. Buffon in this particular, I have taken him for my guide. Nevertheless, there is an animal of the cow kind, which neither he nor any other naturalist that I know of, has hitherto described, yet which makes a very distinct class, and may be added as a third species.

This animal was shown some years ago in London, and seemed to unite many of the characteristics of the cow and the hog; having the head, the horns, and the tail of the former; with the bristles, the colour, and the grunting of the latter. It was about the size of an ass, but broader and thicker; the colour resembling that of a hog, and the hair bristly, as in that animal. The hair upon the body was thin, as in the hog; and a row of bristles ran along the spine, rather shorter and softer than in the hog kind. The head was rather larger than that of a cow; the teeth were entirely resembling those of that animal, and the tongue was rough in like manner. It fed upon hay; and consequently its internal conformation must have resembled that of the cow kind more than the hog, whose food is always chosen of a kind more succulent. The eyes were placed in the head as with the cow, and were pretty nearly of the same colour; the horns were black and flattish, but bent rather backwards to the neck, as in the goat kind; the neck was short and thick, and the back rather rising in the middle; it was cloven-footed, like the cow, without those hinder claws that are found in the hog kinds. But the greatest variety of all in this extraordinary creature, which was a female, was, that it had but two teats, and consequently, in that respect, resembled neither of the kinds to which, in other circumstances, it bore so strong a similitude. Whether this animal was a distinct kind, or a monster, I will not pretend to say: it was shown under the name of the bonasus; and it was said, by the person who showed it, to have come from India: but no credit is to be given to interested ignorance; the person only wanted to make the animal appear as extraordinary as possible; and I believe would scarcely scruple a lie or two to increase that wonder in us, by which he found the means of living.

Note A.—*Varieties of Domestic Cattle.*

The breeds of the Kisghuise and Calmuck Tartars, those of Podolia and Ukraine, of European Turkey, of Hungary, and of the Roman States, are among the largest varieties of cattle known. They are nearly all distinguished by ample horns, spreading sideways, then forwards and upwards, with dark points. Their colour is a bluish-ash passing to black. That in the Papal dominions is not found represented on the ancient bas-reliefs of Rome, but was introduced most probably by the Goths, or at the same time with the buffalo. Italy possesses another race, presumed to have existed in the Pagan times, valued for its fine form and white colour. It is not so large, but the horns are similarly developed. Tuscany produces this race, and droves of them were transplanted to Cuba and imported into Jamaica. Ancient Egypt nourished a large, white breed, which, however, is not the most common upon the monuments of that country, where the cattle are usually represented with large irregular marks of black or brown upon a white ground. In Abyssinia there is also a large white breed; but the greater number are variously coloured. The Caffres and Hottentots rear a fine race, likewise marked with large brown or black clouds: some are of extraordinary size, with the horns directed forwards and upwards. It is from these that their *Backely*, or war-oxen, are chosen. They are quick, persevering, extremely docile, and governed by the voice or a whistle of the owners with surprising intelligence. They thrive most on the saline pastures; and that kind of food may cause the peculiarly fetid smell of their breath noticed by Barrow. The long horns of some of this breed are often trained by the Namaguas and other tribes, so as to twist in spiral curves or other fanciful forms. Denmark rears a breed of large stature, which most likely produced the tall Dutch race, of which we have seen one weighing a thousand pounds. From this race sprung the Holstein, which was the parent of the old unimproved English breeds. The Vandals or Goths may have conducted it into Spain, and left its traces in the large breeds of Salamanca. Transported from thence to South America, it probably furnished the root of the fine races which cover the pampas near Buenos Ayres, and in Cuba; while the large English ox supplied that of the United States. Breeds with small and middle-sized horns exist in the Crimea, and in a great part of Germany, Sweden, France, England, Italy, and Spain; and the polled races, or hornless cattle—originally, as it would appear, a German breed, "ne armentis quidem honor aut gloria frontis," according to Tacitus—have spread to Iceland and Norway, where they are often fed on dried fish. They are now abundant in Scotland, and exist in France, and about Penaranda in Spain, whence they may have been transported to form the polled breed of Assomption in Paraguay. They are also common in Abyssinia and Madagascar.

The following is a short account of the principal British breeds, derived from the several above-noticed races.

1. The *Long-horned* or *Lancaster* breed, distinguished by long horns and thick firm hides, long close hair, large hoofs, and depth of the fore-quarter. They give in proportion less milk but more cream. They are of various colours, but in general *finched*, that is, with a white streak along the spine, and a white spot inside of the houghs. — The *Improved Leicester* is a slight variety originally bred at Canly near Coventry.

2. The *Short-horned*, sometimes called the *Dutch*, includes the varieties named the *Holderness*, *Teeswater*, *Yorkshire*, *Durham*, and *Northumberland*. This is the most improved breed. It usually produces twenty-four quarts of milk per day, and butter to three firkins per season. Their colours are much varied, but generally red and white mixed, or what the breeders call *flecked*. These oxen commonly weigh from sixty to one hundred stone, 14 lb to the stone. They have been fed to 130, and particular ones to 150 stone, the fore-quarters only.

3. The *Middle-horned*, comprehending the *Devon*, *Hereford*, and *Sussex*, most esteemed for draught, active and hardy, do not milk so well as the former, but fatten early. The *Devons* to be pure, must be of a high red colour without white spots; a light dun ring round the eye, and the muzzle of the same colour; fine in bone, and clear neck; thin faced, the tail set on high. The cows of this breed weigh from 30 to 40 stone, and the oxen from 40 to 60. The North Devon is the most esteemed for its flesh. The Sussex and Hereford are larger, of a deep red colour, well-made, and bone not larger. An ox weighs from 60 to 100 stone.

4. The *Polled* breeds—of which the most esteemed is the Galloway—are straight in the back, well-moulded, with soft hair, black or dark brindled. They weigh generally about 40 stone, before they are regularly fattened. They travel well, and reach the London markets without deterioration.—The *Suffolk Duns* are a variety of this race, introduced from Scotland, and crossed.

5. The *Highland* race consists of several varieties, of which the West Highland, Argyleshire, or Skye, form the most valuable. Of these the *Kyloe* from the Hebrides, are so named, because in their progress to the south, they cross the kyloes or ferries in the mainland and Western Islands. The bulls are of middle size, of a black dark-brown, or reddish-brown colour without white; head small; muzzle fine; horns rather slender and of a waxy green. They weigh about 50 stone.—The other variety is the *Norlands*. Their hides are coarse, the make narrow and long-legged.—The *Orkney* or *Shetland* is of a diminutive size; an ox weighing only about 60 lbs a quarter; and a cow 40. They are of all colours, and their shapes generally bad; but they give a quantity of excellent milk, and fatten rapidly.

6. The *Fifeshire* appears to be an improved breed of the Highland crossed with the Cambridgeshire

They are black, spotted, or gray. The horns are small, white, and very erect.—The *Aberdeenshire* is a variety of them.

7. The *Welsh* have two breeds. Of these one is large, and dark-brown with some white, denoting a cross from the long-horned. They have long and slender legs; the horns are white and turned upwards. The other breed is lower, well-formed, black, with little white, and good milkers.

8. The *Alderney*, or more properly *Guernsey*, is small, mostly yellow, or light red, with white about the face and limbs. They have crumpled horns. The true Alderney is distinguished by a yellow colour within the ears, at the root of the tail, and of the tuft at the end of it. They give excellent milk and fine beef

The numerous and important advantages which man derives from the domestic animals, have led all nations from their earliest origin to regard them with the most scrupulous attention. On referring back to the first ages of which we have any authentic records, we see the chiefs of tribes, the patriarchs and first sovereigns, paying a special attention to the management of cattle, and founding on this solid basis, not only their own prosperity, but that of their contemporaries and descendants. The sacred books and the most ancient historians furnish repeated examples of these facts, which are too well known to be repeated here. At this remote period, when man, just formed by the Divine Power, entered upon the dawn of his civilization, the domestic animals were considered not only as the most firm support of agriculture, but they yielded the most valuable materials for commerce. As the principal wealth of the times consisted in domestic animals, these naturally became the first medium of exchange between nations. Cattle were therefore the first money that existed, as they were the first article which possessed exchangeable value. We have a confirmation of this fact in the circumstance, that the first acknowledged representatives of mercantile value, the earliest metallic money which passed current, was decorated with an image of these animals, indicating that it maintained an equal value. They were also the earliest offerings presented by most nations to their deities; and the ancient Egyptians worshipped the bull (*Apis*) with the highest veneration. If we turn to that nation which has left us the most extensive and important written monuments of its experience in the different branches of rural economy, we shall find the ancient Romans applying themselves with remarkable zeal to the training and management of cattle. We have an evidence of this fact in the term *jumenta*, which they applied generally to all kinds of cattle, derived from *juvare*, to help. There is also the term *pecunia*, money, from which we have derived our English adjective *pecuniary*, and the Latin term *peculium*, from which we have derived our *peculation*, alike derived from *pecus*, which the Romans applied to cattle in general. Cato the elder, the first of their agriculturists who has transmitted his precepts to our times, on being asked by some persons to point out that particular branch of rural speculation which should command their first attention, if they wished to acquire wealth in the quickest possible manner, is said to have replied, "Manage your cattle well;" and on being again asked, what was the next best object of their attention, if they wished to derive only a tolerable return for their labour, he replied, "Manage your cattle tolerably well." In the countries of civilized Europe, we find that a large portion of the wealth of their inhabitants consists in cattle; and we can commonly form a good notion of their respective degrees of agricultural prosperity, as well as of the comforts of the cultivator, by noticing the number and quality of the domestic animals.

Although much has recently been done to illustrate what has been called the Bovine tribe of animals, more familiarly known as oxen, yet much still remains to be effected. The whole group is, by most naturalists, following Baron Cuvier, classed as one genus, namely, that of *bos*, and all the associate animals are considered merely as so many species and varieties. This renders the genus very extensive, almost too much so for convenient study; and, besides, so many and such marked differences abound, that it seems expedient to carry the subdivision somewhat further. This, accordingly, has been done by some eminent zoologists; and hence, in addition to the *ovibus* genus of M. de Blainville, at present composed, we believe, of the musk-ox alone, three sub-genera have been proposed, viz., the *bos* or genuine oxen, with their innumerable varieties in almost every part of the world; the *bison*, including the American bison, and several other animals; and, thirdly, the *bubalus* or buffalo group, some of which are familiar domesticated animals, whilst others are wild. It should here be observed that this term *wild*, as applied to cattle, is used in widely different senses. As is well known, the domestic Spanish breed was transported to South America soon after its discovery. There they found a most congenial climate and soil, and the race soon exceeded the requirements of the settlers, and ranged in innumerable thousands over the fertile Pampas. These cattle, far removed from the haunts of man, soon became estranged from him, acquired new tastes and habits, and in many respects exhibited a perfect contrast to their still domesticated relatives. Nor is this to be considered as a solitary occurrence. Under such circumstances the cattle are denominated *wild cattle*, and they acquire many claims to the appellation. But though their habits are changed, their nature, it appears, is not; and experience has shown that by a little trouble, and patient management, even the adult animals may, in a few weeks, be afresh brought under the control of man. Very different, however, is it with some other varieties distinguished as wild cattle, such, for example, as the African buffalo, which it would appear is as little susceptible of subjugation and domestication as the jaguar or the tiger. This common appellation applied in a two-fold sense, together with the fact that certain changes are usually superinduced on the external appearance, greatly augments the difficulty of arriving at positive conclusions concerning the specific distinctions of many of the animals that are subjected to our examination.

Note B.—*The Bison.*

Among the bisons are found indications of an ancient and colossal species existing at one time in Europe and Northern Asia, and even in America, attested by the repeated discovery of enormous skulls in the diluvian strata of the earth, on the vegetable mould, and even beneath, among the remains of the mastadon and rhinoceros. The name *aurochs*, applied to the bison by the Germans, is evidently the origin of the Latin urus; but Cuvier, following up with his usual research the observations of Herberstein, establishes beyond a doubt, that the true urus may still have existed in some parts of Massovia, by the name of *thur*, in the time of the last-mentioned author, although it is now extinct in Europe and Western Asia, and its name transferred to the bison of the ancients, which the Poles at this day still distinguish by the appellation of *zubr*, and the ancient Germans called *wizend* and *bisam*. It is distinguished by an elevated stature, measuring 6 feet at the shoulder, and 10 feet 3 inches from the nose to the tail.

2. The *Gaur*. (*Bos Gaurus.*) The gaur is a species of bison, which, from all accounts, appears to be among the largest now living. The head of the gaur exhibits nearly all the characters of a domestic ox, but the forehead is more arched and raised; the

horns are strong and rough, not bent back as in the buffalo; the top of the forehead is covered with white woolly hair; the rest of the hair is smooth, close, and shining, of a dark-brown colour, almost black; the eyes are smaller than in the ox, and pale blue; the muscles of the legs and thighs are very prominent and strong. But the most remarkable character of the gaur, that which should distinguish it from all other ruminants, consists in a series of spinous processes along the back, beginning at the last vertebræ of the neck, and shortening gradually till they are lost half-way down the spine. The foremost are at least six inches higher than the ridge of the back. These gaurs live in families of ten or twenty, graze on the meadows, and feed on leaves and buds of trees. Buffaloes fear their presence, and never invade their localities. Although the existence of this animal is more questionable in Africa, yet Pliny's Æthiopian bull with blue eyes might refer to this species; and even the white variety, as large as a camel, known in Madagascar by the name of Bouri, may be the same.

3. The *American bison*. (*Bos Americanus*.) This species is commonly known by the name of buffalo, and was long confounded with the bison of Europe, though it is anatomically more remote from it than the yak, notwithstanding the great external similarity between them. This species is distinguished by small horns, round, lateral, black, very distant, turned sideways and upwards. The height at the shoulder is about 5 feet, and at the croup 4; length from nose to tail 8 feet. But these dimensions must be considerably increased in some individuals, this animal being reported sometimes to weigh 1,600 and even 2,000 pounds. The structure of the animal is heavy in front, but meagre and weak behind. The body is long, having fifteen pair of ribs, and only four coccigian vertebræ. The eyes are round and dark; the chaffron is short; the forehead broad, and the muzzle wide. Upon the summit of the head there is a vast quantity of long woolly hair, hanging over the face, ears, and horns; the neck is a little arched, and the withers are greatly elevated. Upon the face the hair is rather curled, but on the cheeks, throat, neck, shoulders, breast, and upper arms, very long. The back, flanks, croup, thighs, and legs, are covered with close short hair. The tail, about eighteen inches long, is terminated by a long tuft of coarse hair. The colour in winter is a purplish brown-black, turned rusty by the effects of the sun and weather, so as to become light-brown in summer. The female is smaller; its horns are less, and the quantity of hair on the anterior parts much smaller.

These animals are in the habit of standing with the feet much more under them than domestic cattle, and then they appear as if their body was shorter. They reside in winter as much as possible in the woods of temperate North America, ascending the mountains and penetrating into New Mexico. Towards summer, they migrate northwards, and in their passage both in spring and autumn, occasionally form herds of several thousands. They are not naturally dangerous, but irritable; we have seen them leap over fences four feet high, and defend themselves against bull-dogs with much spirit and more activity than the domestic bull; they turn with great quickness, and being covered by their shaggy hair, dogs seldom seize them firmly. Young animals acquire a certain temporary docility, and might be used to the plough: but the elevation of the shoulders, and their weakness about the loins, will never allow such profitable use to be made of them as of the domestic ox. Besides, the females do not retain their milk long, and yield a smaller quantity, which is said to smell musky. Formerly the species was known to the eastward of the Apalachian mountains, but they are no longer found in the remote parts of Pennsylvania or in Kentucky, and only seen beyond the Mississippi. On the Ohio and Missouri they still exist in great numbers. The Indians shoot them or encompass a herd by firing the grass, when a number are destroyed without difficulty. In the northern parts they drive them into a kind of staked avenues, or keddah, while the snow is on the ground, and kill them from a tree in the centre of the recess, and from around it.

4. The *Yak*. (*Bos Poephagus*.) This animal was originally noticed by Ælian under the above name, and since described by Pallas, who preferred as a specific designation *grunniens* or grunting; but it should rather be groaning, as its voice has no similarity with the grunt of a hog. The yak bears some resemblance to a buffalo in the form of the head; but it is shorter, more convex, and thicker about the muzzle. The ears are wide and horizontal; the eyes large; the muzzle is small, and the nostrils almost transverse. The lips are tumid; the forehead is rather flat; the top of the head convex between the ears, and covered with frizzled woolly hair; the neck of the male thick; the withers elevated but not hunched; the mammæ are placed in a transverse line, and the body furnished with fourteen pair of ribs. The hair of the forehead whirls, and is close; that on the neck, back, and sides, is long, woolly, pendant in winter, but shorter on the sides in summer and in low warm situations. From the shoulders, along the spine, there is a streak of hair generally grayish, and turned forwards; the tail, furnished with long and finer hairs than in the horse, reaches to the heels. The stature of the animal varies, the smaller being only 7 feet long, and 3 feet 10 inches at the shoulder. But there are larger varieties. The horns are round, smooth, pointed, lateral, bending forwards and upwards, black or white with black tips, or even pure white. There are some hornless. The colour varies greatly, but in general it is black; many have their fine tails pure white, as also the ridge on the shoulders, which is abundantly covered with light frizzled hair. Like the rest of the bisontes, the yaks are more fond of mountainous woods and valleys, than the open plains, keeping on the south side in winter, and on the north in summer. They are said to be fond of wallowing in water, and to swim well. The mountains of Bhotan and Thibet offer a principal asylum to the wild species. Here they appear to enjoy the vicinity of the snow; but they are also spread over a great part of China, and even to Central India, where they seem to be without woolly hair, but still marked by the white feet. We are inclined to consider the white species of wild cattle in the Ramghur mountains as a variety of this species. The yak inhabits also the Altaic mountains, and supplies milk to the Calmucks, and the Mongolian and Doukta Tartars. The Chinese name them *Si-nvn* or water-ox, and adorn their caps with the fringes of the hair.

5. The *Gayal* is nearly the size and shape of an English bull, with a dull heavy appearance; but at the same time, of a form equal in strength and activity with the wild buffalo. It has short horns, which are distant at the bases, and rise in a gentle curve directly out and up. The head at the upper part is very broad and flat, and contracted suddenly towards the nose, which is naked like that of the common cow. From the upper angles of the forehead proceed two thick short horizontal processes of bone, which are covered with a tuft of lighter coloured hair; on these are placed the horns, shorter than the head, and lying nearly on the plane of the forehead, towards the tips rounded, and ending in a sharp point. The eyes resemble those of a common ox; the ears are much longer, broader, and blunter than those of that animal; the neck is very slender near the head, at some distance from which a dewlap commences, but this is not so deep nor so much un-

dulated as in the zebu. The dewlap is covered with strong longish hair, so as to join a kind of mane on the lower part of the neck; but is not very conspicuous, especially when the animal is young. In place of the hump, the gayal has a sharp ridge, which commences on the hinder part of the neck, slopes gradually up till it comes over the shoulder joints, and then runs horizontally along a third part of the back, and terminates with a sudden slope. The height of this ridge makes the neck appear much depressed, and also adds greatly to the clumsiness of the chest, which, although narrow, is very deep. The sternum is covered by a continuation of the dewlap; the belly is protuberant, but in its hinder part is greatly contracted; the rump has a more considerable declivity than that of the European ox, but less than that of the zebu. The tail is covered with short hair, except near the end, where it is tufted, but descends no lower than the shins. The legs, especially the fore ones, are thick and clumsy; the false hoofs are much larger than those of the zebu; the hinder parts are weaker in proportion than the forehead; and owing to the construction of the belly, the hinder legs, although, in fact, the shortest, appear to be the longest. The whole body is covered with a coat of short hair. The general colour is brown in various shades, which very often approaches to black, but it sometimes is rather light. The legs and belly are usually white, as also the tip of the tail. The head is about 1 foot 8 inches long, and the distance between the roots of the horns 10 inches. The total length from nose to tail is about 9 feet 6 inches; height at the shoulders, 4 feet 9 inches; height at the loins, 4 feet 4 or 5 inches. The voice of the gayal has no resemblance to the grunt of the Indian ox; it is a kind of lowing, but not near so loud as that of the European ox. The Cucis or Lunctas, a people inhabiting the hills to the eastward of Chayaon (Chitagong), have herds of the gayal in a domestic state. By them it is called *Shial;* whence probably its name of Gayal. It is possible that the wild cattle of Siam noticed by Colonel Syms under the name *catin*, are of this species.

6. Beside the above existing species, it may be proper to mention the fossil bisons. The ***Broad-headed Fossil Bison*** of Dr. Harlan, as described by Cuvier, differs little in the skull from that of the bison, except in its greater dimensions. The forehead is arched, broader than high; the horns are attached two inches before the line formed by the union of the facial and occipital surfaces, which latter form an obtuse angle; the plane of the occiput represents a semicircle. The horn is 21 inches in circumference at its base. A fragment of this size was found in Kentucky, and similar skulls have been discovered near Melnick in Bohemia, in Italy, and on the Rhine, in Russia, Siberia, and probably over the whole northern hemisphere.

The ***Bos Bombifrons*** of the same American author is described by Mr. Wistar from a skull presented by Mr. Jefferson to the American Philosophical Society. The top of the head between the horns is strongly arched and projecting; the facial line forming rather an acute angle with the occipital surface. The horns first project laterally from the sides of the head, and then curve downwards; they are placed on the skull at a considerable distance anterior to the union of the facial and occipital surfaces. The specimen—injured and wanting the face and jaws—was found in Bigbonelick near the falls of the Ohio. The affinity seems to be nearest to the Tartaric Yak.—*See the 'Animal Kingdom' of Cuvier. Supplement to the order Ruminantia. By Major Smith.*

NOTE C.—*The Buffalo.*

Buffaloes in general are animals of a large stature, resembling a bull, low in proportion to their bulk, and supported by strong and solid limbs. The head is large; the forehead, though narrow, is remarkably strong and convex: the chaffron straight, flat, prolonged, and terminated by a broad muzzle; the horns being flat or bending laterally, with a certain direction to the rear, and therefore not very applicable in goring; the ears are rather large, never erect, funnel-shaped; the eyes large; they have no hunch on the back, but a small dewlap on the breast. The females bear an udder with four mammæ, two of which are sometimes not developed; the tail is long and slender; the back rather straight; the hide black, more or less covered with hair of an ashy or blackish colour; sometimes it is brown or white. They avoid hills, preferring coarse plants of the forest and such as grow in a swampy regions, to those of open plains; they love to wallow and lie for hours sunk deep in water; they swim well, or rather float on the surface, and consequently pass the broadest rivers without hesitation; their gait is heavy, and unwieldy, and run almost always with the nose horizontal, being principally guided by their sense of smelling; but this attitude prevents their seeing beneath them, and conceals their horns. In their combats, they usually strike or butt with the forehead, endeavour to lift the opponent on their horns, and when thrown to crush him with their knees: they trample on the body, and their vindictive fury is so lasting, that they will return again and again to glut their vengeance upon the same inanimate corpse; they herd together in small flocks, or live in pairs, but are never strictly gregarious in a wild state; they have a tenacious memory, and they low in a deep tone. The females bear calves two years following, but remain sterile during the third; gestation is said to last twelve months, but it appears not to exceed ten, they propagate at four and a half years old, and discontinue after twelve. Parturition (in Europe) takes place in the spring, and never exceeds one calf. Dr. Pallas asserts that they breed with domestic cattle, but that the produce usually dies: their life may extend to twenty-five years.

Although in a domestic state they are not remarkable for docility or attachment to their keepers, yet a feeling of this kind, mixed no doubt with instinctive antipathy, is exemplified in an anecdote related by Mr. D. Johnson. "Two biparies, or carriers of grain and merchandise on the backs of bullocks, were driving a loaded string of these animals from Palamow to Chitrah: when they were come within a few miles of the latter place, a tiger seized on the man in the rear, which was seen by a *guallah* (herdsman), as he was watching his buffaloes grazing: he boldly ran up to the man's assistance, and cut the tiger very severely with his sword; upon which he dropped the biparie, and seized the herdsman. The buffaloes observing it, attacked the tiger, and rescued the herdsman; they tossed him about from one to the other, and, to the best of my recollection, killed him. Both the wounded men were brought to me; the biparie recovered, and the herdsman died." This anecdote reveals, if not attachment, great antipathy and courage; and it is well known that neither the tiger nor the lion are inclined to prey upon the buffalo, whose vengeance is probably kept alive by occasional depredations upon their young, and Indian herdsmen do not scruple to pass the night in the most dangerous jungle, seated upon the back of some one favourite animal. Their extreme hostility to red colours is often remarked in India: the same antipathy is observed at the Cape and in Europe. A general officer, now living, relates, that while a young man he was employed in surveying in Hungary, and happening to use a small plane table, the back of which was covered with red morocco: as he walked from one station to another, he sometimes carried it with the paper against his breast, and the crimson colour in front. On a sudden, he perceived at a cussiderable distance a herd of grazing buffaloes throw out signs of defiance, and come down in full gallop towards him with their tails up, and evincing the most tumultuous frenzy. Not suspecting the cause, he paused and dropped his hand, when the whole troop stopped and looked about, as if at a loss; he went on, and unconsciously raising the table again, brought the red colours in sight. They set off a second time towards him, but guessing the cause, he turned the obnoxious colours towards his body, and was suffered to proceed unmolested.

The *Cape Buffalo*. (*Caffer*.) This species is designated among the Hottentots by the name of Qu'araho. It is distinguished by dark and rugous horns spreading horizontally over the summit of the head in the shape of a scalp, with the beams bent down laterally, and the points turned up. They are from eight to ten inches broad at the base, and divided only by a slight groove, dark-coloured, extremely ponderous, cellular near the root, and five feet long, measured from tip to tip along the curves. The incisor teeth are almost always loose in the gums of the adult animal, whose height is about five feet six inches at the shoulder, and the length from nose to tail about nine feet; the legs are short and strongly knit; the dewlap is rather considerable; the ears large, hanging open; on each side of the chin and nether jaw, there is a beard of stiff hairs; the hide extremely thick, hard, and black, almost naked in old animals, tail quite naked, excepting some distichous hairs at the end. In younger beasts a scattered brown hair covers the neck, back, and belly; and in the young heifer, the colour is brown-black, the hair more abundant, and a sort of standing mane four inches long, spreads from behind the horns, along the neck, down the spine to the tail, darker than the rest of the hair, almost black. At that age, the horns are only six inches long, thirteen inches distant from tip to tip, pale in colour, originating at the side of the frontal chest, and rising obliquely upwards with some slight indication of wrinkles. The forehead and nuccha are covered with loose black hair, as also the throat, dewlap, and top of the tail, the shin-bones and pasterns furnished with curling woolly dark hair. The head is one foot long, and the length of the animal, from nose to tail, five feet seven inches; the tail one foot. At that age, there is so great a dissimilarity from the adult, as to give it the appearance of a different species, for which, indeed, it was taken in the specimen of Mr. Burchell, had not a note within the skin established the species. There is some doubt whether Pliny alludes to this species in his description of the fierce African wild oxen which were caught in pitfalls:* the Araho is truly a terrible and ferocious beast, possessed of a tremendous bellowing voice, and moving with considerable swiftness, but so ponderous as to be disinclined to ascend; its scent is keen, but the breadth of the horns impedes its sight. This species of buffalo lives in families or small herds in brushwood and open forests of Caffraria, occasionally uniting in droves upon the plain. Old bulls are often met alone, but though these are, if possible, still fiercer than the younger, they are less swift or inclined to exertion. In the woods they make paths for themselves, where it is extremely dangerous to fall in with them. Professor Thunberg gives an appalling account of the destruction of two horses by one of these animals, the riders providentially escaping by climbing trees, and the professor himself driven to the same expedient, though his horse remained unhurt, owing to the buffalo turning into the wood. Sparmann, who first fully described this species, is no less animated in the dangerous hunting exploits he witnessed. They are excited to madness by the sight of red colour, and swim with great force. The hide is made into shields, cut into whips and traces, and is so hard that a musket ball will scarcely penetrate into it, unless the lead be mixed with tin. If this animal could be rendered tractable, it would make the most powerful in agriculture existing. Since the increase of the settlements about the Cape of Good Hope, the buffalo is become more scarce in the colony, but they spread along the eastern side of Africa to an unknown distance in the interior.

The *Pagasse*. (*B. Pegassus*.) The names of Pacasse of Gallini and Carli, Empaguessa of Merolla, Empacasse of Lopes and Marmol, indicate an animal, presumed to be a species of buffalo, but not described with sufficient precision to be admitted into the catalogues of nomenclators. The word is evidently of great antiquity and extent, as may be gathered from Pliny, although at present banished from the regions where the Arabic has usurped the ancient language, and confined to the regions of Angola and Congo, where it is coupled with the generic name *Em* or *En*, denoting a Bovine animal. Thus Engamba a cow, Empalanga, another large ruminant which is conjectured to be the Tackhaitze of Daniell; and Empacasse. Pliny relates that Æthiopia produces winged horses, armed with horns named Pegasi. Fathers Gallina and Carli observe, that, "On the road to Loando in the kingdom of Congo, they saw two pacasses, which are animals very similar to buffaloes, roaring like lions; the male and female being always together. They are white with rufous and black spots; *with ears half-a-yard in length*, and the horns always straight. When they see human beings they do not flee, nor do they harm, but stand and look on." Lopes describes them as somewhat less than an ox, but similar in head and neck. Dapper reports them to be buffaloes of a reddish colour with long horns. These testimonies are very vague, but still indicate one and the same animal, partially misrepresented. To these accounts might be added the notice of Captain Lyons respecting the Wadan, "a fierce buffalo, the size of an ass, having long tufts of hair on the shoulders, and very long heavy horns."

The *Arnee*. (*B. Arni*.) India and China are the native regions of another group of true buffaloes, both wild and tame, which Baron Cuvier's investigations refer to one species, divided into mere varieties. It appears, that the wild buffalo in the central districts of Bengal, is commonly named Arnee or Arnaa, and distinguished by the lunate form of the horns and black colour; while the second sort, usually but not always domestic, is known by the appellation of *bhain* or byne. Of this sort, the horns are much shorter, bent back towards the neck with the points turned upwards: thus constructed, their arms are but indifferent instruments of attack, and serve only to lift, while in the former they are invariably used for goring. But neither of these are the gigantic or taurelephant arnee, which appears to be a rare species, only found single or in small families, in the upper eastern provinces and forests at the foot of Himalaya, though formerly met in the Ramghur districts. It is probably the same which the Mugs and Burmas name Phang, and consider next to the tiger the most dangerous and fiercest animals of the forests. A party of officers of the British cavalry, stationed in the north of Bengal, went on a three months' hunting expedition to the eastward, and destroyed in that time forty-two tigers, but only one arnee, though numerous wild buffaloes became their quarry. When the head of this specimen rested perpendicular on the ground, it required the outstretched arms of a man to hold the points of the horns. These are described as angular, with the broadest side to the rear, the two others, anterior and inferior, wrinkled, brownish, standing outwards, not bent back, straight for near two-thirds of their length, then curving inwards with the tips rather back; the face is nearly straight, and the breadth of the forehead is carried down with little diminution to the foremost grinder. The best figure, we are assured, is in Captain Williamson's 'Oriental Field Sports.' Captain Williamson evidently speaks of the true arnee in the anecdote, where one of these animals pursued a sportsman to his elephant, and ran its horns under his belly to lift him up. This individual was killed, and was upwards of six feet high at the shoulder, nearly three feet in breadth at the breast, and the horns five feet and a half long.

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* He gives it blue eyes, and rufous hair. Cap. xxi. l. viii., but it seems confounded with a species of bison. If Captain Clapperton's notice be referred to *B. Caffer*, it is found also in Bornou, under the name of *Zamouse*, the Arabic *Yamus*.

The other or common arnee is also a very large animal, though nearly a foot lower at the shoulders than that last mentioned. It is not much less in weight; the head is smaller, the body longer, the tail reaching to near the heels, and the hide more scantily covered with hair. These are much more common, live gregariously in woody swamps or plains, occasionally floating in whole droves down the Ganges, seemingly asleep, until the current lands them on some island, or on the bank; boats are sometimes endangered by sailing in among them unawares. They are said to plunge under water, and raise aquatic plants with their horn to the surface, where they feed on them, while driving with the stream. An animal of this kind drifted down to near Shaugur Island, in 1790, and was shot by the crew of the Hawkesbury Indiaman, towed alongside, and hoisted in; the meat weighed 360 pounds per quarter, exclusive of the head, legs, hide, and entrails, and the whole could, therefore, be scarcely less than 2,000 pounds, though the ship's butcher pronounced it not above two years old.

A herd of these animals was observed by a column of troops, some years ago, on the march to Patna, by the inland road. On discovering the red dresses of the soldiers, they threw out their usual signals of hostility, and galloped off; then suddenly wheeling round, came in a body, as if they intended to charge, and their horns overtopping their heads, rendered it doubtful whether they were not mounted by some hostile force; part of the column, therefore, halted and formed, and the animals suddenly struck by the glittering of the arms, stopped, turned tumultuously round, and dashed into cover.

These anecdotes show the scepticism of some continental naturalists, respecting the existence of wild buffaloes in India, to be quite misplaced. Formerly, this race was occasionally reduced to a precarious domesticity, by order, and for the amusement of, the native princes, but now they use the largest of the domestic breeds; these are mounted by their keepers and brought into the arena to engage in battle with the tiger, who is almost invariably defeated. The race of the common arnee is also, it would appear, domesticated in the eastern states: a white variety is found in Tinean, and other islands of the Indian Archipelago. On the coast of Cochinchina, and the Malayan peninsula, this race appears to predominate: they are of very great bulk, with the horns, when seen in front, forming a true crescent: their skulls are the usual arnees of European museums. Although the skin of the white variety be rosy, the muzzle and edge of the lips are jet black, the eyes are large and dark, the snout longer and narrower than in the black-skinned buffalo, and their height at the shoulder is not five feet, owing to the legs being short. Those of Siam, both wild and domesticated, are ashy gray, larger than an ox, the muzzle much prolonged, and the horns very long, forming a crescent above the head. This variety has a shrill weak voice, and the domesticated are more easily managed by children than by grown men.

The *Domestic Buffalo.* (*B. Bubalus.*) Whether or not the arnee of Bengal be the stock from which the domestic buffalo is descended, certain it is that the species now under consideration, is still found in a wild state, as well as domesticated, and that in all countries, sufficiently uninhabited and affording the requisite conditions, the black-skinned domestic animal will soon supply a wild breed. This occurs whenever local circumstances are favourable, even in the kingdom of Naples; and we might draw an inference from this fact alone, that the species with crescent horns are distinct from the present, although both have breeds which have received the yoke of man; nor if it were proved that a prolific intermediate race exist, produced by the intermixture of both, would it fully determine that both form only one original species. What forms a species, and what a variety, is, as yet, far from well understood. The bhain of India may be regarded as the true stock of the domestic buffaloes of southern and western Asia, north Africa, and eastern Europe. Little doubt can be raised, that in India that animal was first subdued, perhaps, by means of the intelligence and powers of the elephant, who alone could compel it to subjection; from thence, commerce or remote military expeditions seem to have introduced it into Tartary and eastern Persia, till by either of these means the domestic buffalo was found on the shores of the Caspian. Here they resided at the time of the Macedonian invasion, though the Tartars seem to have used their busan as beasts of burden, at least, as early, and about that period, or soon after, to have led them to the banks of the Tereck. They were found by the Mahomedan Arabs in Persia, and during their wars brought westward into Syria and Egypt. Baron Cuvier, with his accustomed research, proves the pilgrims and writers concerning Palestine to have noticed them by the name of Buflus, early in the eighth century.

The stature of the buffalo varies according to the circumstances of food and climate. The Hungarian and Italian are about eight feet and a half long, by five feet at the shoulders; the horns are directed sideways, compressed, with a ridge in front, reclining towards the neck and the tips turned up, placed at a great distance from each other, with a convex forehead between them; the mammæ of the male placed in a transverse line; the hair scattered, coarse, and black, and the tail long, terminated by a tuft; the hide is of a purplish black, in India almost naked, in Egypt, sometimes totally without hair, and in the Indian Archipelago the anterior half is occasionally covered with long hair, and the posterior naked; it varies also to rufous, and white occurs in some breeds.

It is an animal at all times of very doubtful docility, with a sombre malignant eye, active, daring, swift, and persevering when excited; dull, slow, wallowing in his ordinary state; naturally preferring flats and swampy soil; possessed of great strength for burden and for the plough, two being equal in power to four horses: but furnishing little and indifferent milk, and worse flesh: the hide and horns are alone valuable. In India, however, they furnish more milk from which a kind of liquid butter is made, well known by the name of *ghee*. The domestic breed in Bengal is not more than four feet and a half high, and used to labour; but for burden, care must be taken that the goods they carry do not suffer from wet, their propensity to lie down in water being invincible; wood and bricks are therefore the most common load. The largest of the wild breed are used by the native princes to supply the place of arnees, and fight with tigers in public shows. With the natives, especially the Guallah cast, or herdsmen, they are docile; they ride on their favourites, and spend the night with them in the midst of jungles and forests, without fear of wild beasts. When driven along the herds keep close together, so that the driver, if necessary, walks from the back of one to the other, perfectly at his convenience. The females are dangerous while they nurse their calf. In Italy, it is asserted that buffaloes are again become wild; the domestic, however, both there and in

Hungary, are managed by means of a ring passed through the cartilage of the nose: in India it is a mere rope. The practice is ancient, and it would seem that the Sclavonic *Wenden* brought buffaloes with them to the shores of the Baltic, if we may judge from the armorial bearings of provinces and families, not unfrequent in the north of Germany and Switzerland; unless we prefer to believe that the urus or parent of the domestic ox, required to be ringed for many generations before it became tractable.—*See the 'Animal Kingdom' of Baron Cuvier. Supplement to the order Ruminantia. By Major Smith.*

CHAP. III.

OF ANIMALS OF THE SHEEP AND GOAT KIND.

As no two animals are found entirely the same, so it is not to be expected that any two races of animals should exactly correspond in every particular. The goat and the sheep are apparently different in the form of their bodies, in their covering, and in their horns.[1] They may, from hence, be considered as two different kinds, with regard to all common and domestic purposes. But if we come to examine them closer, and observe their internal conformation, no two animals can be more alike; their feet, their four stomachs, their suet, their appetites, all are entirely the same, and show the similitude between them; but what makes a much stronger connection is, that they propagate with each other. The buck-goat is found to produce with the ewe an animal that, in two or three generations, returns to the sheep, and seems to retain no marks of its ancient progenitor.[2] The sheep and the goat, therefore, may be considered as belonging to one family; and were the whole races reduced to one of each, they would quickly replenish the earth with their kind.[3]

If we examine the sheep and goat internally, we shall find, as was said, that their conformation is entirely the same; nor is their structure very remote from that of the cow kind, which they resemble in their hoofs, and in their chewing the cud. Indeed, all ruminant animals are internally very much alike. The goat, the sheep, or the deer exhibits to the eye of the anatomist the same parts in miniature which the cow or the bison exhibited in the great. But the differences between these animals are, nevertheless, sufficiently apparent. Nature has obviously marked the distinctions between the cow and the sheep kind, by their form and size; and they are also distinguished from those of the deer kind, by never shedding their horns. Indeed, the form and figure of these animals, if there were nothing else, would seldom fail of guiding us to the kind; and we might almost upon sight tell which belongs to the deer kind, and which are to be degraded into that of the goat. However, the annually shedding the horns in the deer, and the permanence in the sheep, draws a pretty exact line between the kinds; so that we may hold to this distinction only, and define the sheep and goat kind as ruminant animals of a smaller size, that never shed their horns.

If we consider these harmless and useful animals in one point of view, we shall find that both have been long reclaimed, and brought into a state of domestic servitude. Both seem to require protection from man; and are, in some measure, pleased with his society. The sheep, indeed, is the more serviceable creature of the two; but the goat has more sensibility and attachment. The attending upon both was once the employment of the wisest and best of men; and those have been ever supposed the happiest times in which these harmless creatures were considered as the chief objects of human attention. In the earliest ages, the goat seemed rather the greater favourite; and, indeed, it continues such, in some countries, to this day among the poor. However, the sheep has long since become the principal object of human care; while the goat is disregarded by the generality of mankind, or become the possession only of the lowest of the people. The sheep, therefore, and its varieties, may be considered first; and the goat, with all those of its kind, will then properly follow.

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[1] In the sheep-kind the horns are hollow, wrinkled, perennial, bent backwards and outwards, into a circular or spiral form, and generally placed at the sides of the head; in the lower jaw there are eight front teeth, but none in the upper; there are no canine teeth in either. In the goat the horns are hollow, rough, compressed, and rise somewhat erect from the top of the head, and bend backwards; there are eight front teeth in the lower jaw, none in the upper, and no canine teeth in either; the chin is bearded. —Ed.

[2] Buffon, *passim*.

[3] Sheep are so nearly allied to goats, that the distinguishing characters of the two genera are of a trivial nature. The chaffron which in the former is almost invariably more or less elevated, is in the latter occasionally of the same form; the beard is not absolutely wanting in the one, and sometimes absent in the other, and the wool which distinguishes almost all domesticated sheep, in the wild or argalis, is reduced to a rudimental state, little more prominent than in several species of antelope, of deer, and of the wild goat itself. It was believed by the ancients, that sheep are a hybrid production,

> Tityrus ex ovibus oritur, hircoque parente;
> Musimonem capra ex vervegno semine gignit—

and the moderns still relate that the commixture of the two species produces prolific breeds, said to be common in some parts of Russia, and also found in America, where it is known by the name of chabin. There are, however, no well authenticated facts to establish the matter beyond a doubt, and the mere carelessness of the proprietors of flocks is certainly insufficient cause for their existence; for if the two genera intermixed with facility, and remained prolific, most countries would be without the pure breed of either, and possess only the intermediate: and above all, the west coast of Africa would be in that condition, because the wool is there no object, and not the least care is taken in breeding of the domestic animals: and yet several breeds of goats and sheep exist perfectly distinct and without the smallest appearance of having mixed at any former period. The notion of the chabin may have arisen from the sight of sheep, partly clothed with hair, and partly with wool, a breed not uncommon in northern and western Africa, from whence it may have been transported for live stock on board the slave ships to America, and preserved for curiosity or for want of better stock.—Ed.

THE SHEEP.

THOSE animals that take refuge under the protection of man, in a few generations become indolent and helpless. Having lost the habit of self-defence, they seem to lose also the instincts of nature. The sheep in its present domestic state, is, of all animals, the most defenceless and inoffensive. With its liberty it seems to have been deprived of its swiftness and cunning; and what in the ass might rather be called patience, in the sheep appears to be stupidity. With no one quality to fit it for self-preservation, it makes vain efforts at all. Without swiftness, it endeavours to fly; and without strength, sometimes offers to oppose. But these feeble attempts rather incite than repress the insults of every enemy; and the dog follows the flock with greater delight upon seeing them fly, and attacks them with more fierceness upon their unsupported attempts at resistance. Indeed, they run together in flocks rather with the hopes of losing their single danger in the crowd, than of uniting to repress the attack by numbers. The sheep, therefore, were it exposed in its present state to struggle with its natural enemies of the forest, would soon be extirpated. Loaded with a heavy fleece, deprived of the defence of its horns, and rendered heavy, slow, and feeble, it can have no other safety than what it finds from man. This animal is now, therefore, obliged to rely solely upon that art for protection, to which it originally owes its degradation.

But we are not to impute to nature the formation of an animal so utterly unprovided against its enemies, and so unfit for defence. The moufflon, which is the sheep in a savage state, is a bold, fleet creature, able to escape from the greater animals by its swiftness, or to oppose the smaller kinds with the arms it has received from nature. It is by human art alone that the sheep has become the tardy defenceless creature we find it. Every race of quadrupeds might easily be corrupted by the same allurements by which the sheep has been thus debilitated and depressed. While undisturbed, and properly supplied, none are found to set any bounds to their appetite. They all pursue their food while able, and continue to graze, till they often die of disorders occasioned by too much fatness. But it is very different with them in a state of nature: they are in the forest surrounded by dangers, and alarmed with unceasing hostilities; they are pursued every hour from one tract of country to another; and spend a great part of their time in attempts to avoid their enemies. Thus constantly exercised, and continually practising all the arts of defence and escape, the animal at once preserves its life and native independence, together with its swiftness, and the slender agility of its form.

The sheep, in its servile state, seems to be divested of all inclinations of its own; and of all animals it appears the most stupid. Every quadruped has a peculiar turn of countenance, a physiognomy, if we may so call it, that generally marks its nature. The sheep seems to have none of those traits that betoken either courage or cunning; its large eyes, separated from each other, its ears sticking out on each side, and its narrow nostrils, all testify the extreme simplicity of this creature; and the position of its horns also, shows that nature designed the sheep rather for flight than combat. It appears a large mass of flesh, supported upon four small straight legs, ill fitted for carrying such a burden; its motions are awkward, it is easily fatigued, and often sinks under the weight of its own corpulency. In proportion as these marks of human transformation are more numerous, the animal becomes more helpless and stupid. Those which live upon a more fertile pasture, and grow fat, become entirely feeble; those that want horns are found more dull and heavy than the rest;[4] those whose fleeces are longest and finest are most subject to a variety of disorders; and, in short, whatever changes have been wrought in this animal by the industry of man are entirely calculated for human advantage, and not for that of the creature itself. It might require a succession of ages before the sheep could be restored to its primitive state of activity, so as to become a match for its pursuers of the forest.

The goat, which it resembles in so many other respects, is much its superior. The one has its particular attachment, sees danger, and generally contrives to escape it; but the other is timid without a cause, and secure when real danger approaches.[5] Nor is the sheep, when bred up tame in the house, and familiarized with its keepers, less obstinately absurd: from being dull and timid, it then acquires a degree of pert familiarity; butts with its head, becomes mischievous, and shows itself every way unworthy of being singled out from the rest of the flock, Thus it seems rather formed for slavery than friendship; and framed more for the necessities than the amusements of mankind. There is but one instance in which the sheep shows any attachment to its keeper; and that is seen rather on the continent than among us in Great Britain. What I allude to is, their following the sound of the shepherd's pipe. Before I had seen them trained in this manner, I had no conception of those descriptions in the old pastoral poets, of the shepherd leading his flock from one country to another. As I have been used only to see these harmless creatures driven before their keepers, I supposed that all the rest was but invention; but in many parts of the Alps, and even some provinces of France, the shepherd and his pipe are still continued with true antique simplicity. The flock is regularly penned every evening, to preserve them from the wolf; and the shepherd returns homeward at sunset with his sheep following him, and seemingly pleased with the sound of the pipe, which is blown with a reed, and resembles the chanter of the bagpipe. In this manner, in those countries that still continue poor, the Arcadian life is preserved in all its former purity; but in countries where a greater inequality of condition prevails, the shepherd is generally some poor wretch, who attends a flock from which he is to derive no benefits, and only guards those luxuries which he is not fated to share.

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[4] Daubenton upon the Sheep.

[5] The sheep here is hardly dealt with. It certainly is a timid animal, but this shyness, as in other ruminants, is balanced by curiosity, and when once overcome, tends to extreme confidence. It is not under the confined circumstances in which this animal is placed, but it is in the country where no direct constraint has cramped their faculties, and above all, in their wild state, that we should study and appreciate their moral qualities. If we turn our view to an intermediate state, as, for instance, the mountain sheep of Wales, half-wild from the nature of the country, we find them not crowded in close herds, because experience has taught them to feel secure from carnivora, but scattered in groups of twelve or fourteen, one of which is, nevertheless, on the look-out, from a rock or a peak, to give warning of the approach of any strange object, and to give the hissing signal of retreat, when all betake themselves to the most inaccessible parts of the mountain. Such is also the practice of the American, and no

It does not appear, from early writers, that the sheep was bred in Britain; and it was not till several ages after this animal was cultivated, that the woollen manufacture was carried on among us.[6] That valuable branch of business lay for a considerable time in foreign hands; and we were obliged to import the cloth manufactured from our own materials. There were, notwithstanding, many unavailing efforts among our kings to introduce and preserve the manufacture at home. Henry the Second, by a patent granted to the weavers in London, directed, that if any cloth was found made of a mixture of Spanish wool, it should be burned by the mayor. Such edicts, at length, although but slowly, operated towards the establishing this trade among us. The Flemings, who at the revival of arts possessed the art of cloth-working in a superior degree, were invited to settle here; and soon after foreign cloth was prohibited from being worn in England. In the times of Queen Elizabeth this manufacture received every encouragement; and many of the inhabitants of the Netherlands being then forced by the tyranny of Spain to take refuge in this country, they improved us in those arts, in which we at present excel the rest of the world. Every art, however, has its rise, its meridian, and its decline; and it is supposed by many, that the woollen manufacture has, for some time, been decaying amongst us. The cloth now made is thought to be much worse than that of some years past; being neither so firm nor so fine; neither so much courted abroad, nor so serviceable at home.

No country, however, produces such sheep as England; either with larger fleeces, or better adapted for the business of clothing. Those of Spain, indeed, are finer, and we generally require some of their wool to work up with our own: but the weight of a Spanish fleece is no way comparable to one of Lincoln or Warwickshire; and in those countries it is no uncommon thing to give fifty guineas for a ram.[7]

The sheep without horns are counted the best sort, because a great part of the animal's nourishment is supposed to go up into the horns.[8] Sheep, like other ruminant animals, want the upper fore-teeth; but have eight in the lower jaw: two of these drop, and are replaced at two years old; four of them are replaced at

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doubt of all the argalis, whence the difficulty of arriving within gun-shot, which is as well known in Kamschatka as among the Cree Indians. If they be shot, it is, in general, because, feeling secure from dogs, they will stop and look with curiosity from some lofty crag upon their cry beneath, while the wary hunter steals unperceived upon them. Nor are their affections obliterated in a domestic state; he who, in shearing time, when the lambs are put up separately from the ewes, witnesses the correct knowledge these animals have of each other's voices; the particular bleating of the mother, just escaped from the shears, and the responsive call of the lamb, skipping at the same moment to meet her; its startled attitude at the first sight of her altered appearance, and the reassured gambol at her repeated voice and well-known smell; he who observes them at these moments, will not refuse them as great a share of intelligence as their ancient subjugation, extreme delicacy, and consequent habitual dependence on man, will allow. The courage of sheep is superior to that of goats. The males, both wild and tame, alike contend with each other for the possession of the females, by butting with the forehead and horns, running at each other with great force, so as to precipitate the vanquished sometimes over precipices of great height; and the solidity of their skulls is such, that the domestic ram, whose blows strike low, will drive a bull out of the field. Rams, and even weathers, will attack, and sometimes kill, dogs, or foxes. Instances of this kind are not uncommon in the mountainous parts of England, though they might appear incredible on the continent, where sheep enjoy less liberty. British shepherds are also well acquainted with the cunning and the arts sheep will put in practice to elude their vigilance when a young corn-field entices them to theft; and the Scottish and western mountaineers often witness their sagacity in anticipating a storm, by seeking timely shelter under a cliff, where sometimes it is necessary to dig them out of the snow, in which they become buried, without incurring any material injury.—Ed.

[6] British Zoology, vol. i. p. 23.

[7] See Supplementary Note A, p. 315.

[8] Lisle's Husbandry, vol. ii. p. 155.

three years old; and all at four. The new teeth are easily known from the rest, by their freshness and whiteness. There are some breeds, however, in England, that never change their teeth at all; these the shepherds call the *leather-mouthed cattle;* and, as their teeth are thus longer wearing, they are generally supposed to grow old a year or two before the rest.[9] The sheep brings forth one or two at a time; and sometimes three or four. The first lamb of a ewe is generally pot-bellied, short, and thick, and of less value than those of a second or third production; the third being supposed the best of all. They bear their young five months; and, by being housed, they bring forth at any time of the year.

But this animal, in its domestic state, is too well known to require a detail of its peculiar habits, or of the arts which have been used to improve the breed. Indeed, in the eye of an observer of nature, every art which tends to render the creature more helpless and useless to itself, may be considered rather as an injury than an improvement; and if we are to look for this animal in its noblest state, we must seek for it in the African desert, or the extensive plains of Siberia. Among the degenerate descendants of the wild sheep, there have been so many changes wrought, as entirely to disguise the kind, and often to mislead the observer. The variety is so great, that scarcely any two countries have their sheep of the same kind; but there is found a manifest difference in all, either in the size, the covering, the shape, or the horns.

The woolly sheep,[10] as it is seen among us, is found only in Europe, and some of the temperate provinces of Asia. When transported into warmer countries, either into Florida or Guinea, it loses its wool, and assumes a covering fitted to the climate, becoming hairy and rough; it there also loses its fertility, and its flesh no longer has the same flavour. In the same manner, in the very cold countries, it seems equally helpless and a stranger; it still requires the unceasing attention of mankind for its preservation; and although it is found to subsist as well in Greenland as in Guinea,[11] yet it seems a natural inhabitant of neither.

Of the domestic kinds to be found in the different parts of the world, besides our own, which is common in Europe, the first variety is to be seen in Iceland, Muscovy, and the coldest climates of the north. This, which may be called the Iceland sheep, resembles our breed in the form of the body and the tail; but differs in a very extraordinary manner in the number of the horns; being generally found to have four, and sometimes even eight, growing from different parts of the forehead. These are large and formidable; and the animal seems thus fitted by nature for a state of war: however, it is of the nature of the rest of its kind, being mild, gentle, and timid. Its wool is very different also from that of the common sheep, being long, smooth, and hairy. Its colour is of a dark brown; and under its outward coat of hair it has an internal covering, that rather resembles fur than wool, being fine, short, and soft.

The second variety to be found in this animal is that of the broad-tailed sheep, so common in Tartary, Arabia, Persia, Barbary, Syria, and Egypt. This sheep is only remarkable for its large and heavy tail, which is often found to weigh from twenty to thirty pounds. It sometimes grows a foot broad, and is obliged to be supported by a small kind of board, that goes upon wheels. This tail is not covered underneath with wool, like the upper part, but is bare; and the natives, who consider it as a very great delicacy, are very careful in attending and preserving it from injury. Mr. Buffon supposes that the fat which falls into the caul in our sheep, goes in these to furnish the tail; and that the rest of the body is from thence deprived of fat in proportion. With regard to their fleeces, in the temperate climates, they are, as in our own breed, soft and woolly; but in the warmer latitudes, they are hairy; yet in both they preserve the enormous size of their tails.

The third observable variety is that of the sheep called *strepsicheros.* This animal is a native of the islands of the Archipelago, and only differs from our sheep, in having straight horns, surrounded with a spiral furrow.

The last variety is that of the Guinea sheep, which is generally found in all the tropical climates, both of Africa and the East Indies. They are of a large size, with a rough hairy skin, short horns, and ears hanging down, with a kind of dewlap under the chin. They differ greatly in form from the rest, and might be considered as animals of another kind, were they not known to breed with other sheep. These of all the domestic kinds, seem to approach the nearest to the state of nature. They are larger, stronger, and swifter, than the common race; and, consequently, better fitted for a precarious forest life. However, they seem to rely, like the rest, on man for support; being entirely of a domestic nature, and subsisting only in the warmer climates.

Such are the varieties of this animal, which have been reduced into a state of domestic servitude. These are all capable of producing among each other; all the peculiarities of their form have been made by climate and human cultivation; and none of them seem sufficiently independent to live in a state of savage nature. They are, therefore, to be considered as a degenerate race, formed by the hand of man and propagated merely for his benefit. At the same time, while man thus cultivates the domestic kinds, he drives away and destroys the savage race, which are less beneficial, and more headstrong. These therefore, are to be found in but a very small number, in the most uncultivated countries, where they have been able to subsist by their native swiftness and strength. It is in the more uncultivated parts of Greece, Sardinia, Corsica, and particularly in the deserts of Tartary, that the moufflon is to be found, that bears all the marks of being the primitive race; and that has been actually known to breed with the domestic animal.

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[9] Lisle's Husbandry, vol. ii. p. 155.

[10] Buffon, vol. xxiii. p. 168.

[11] Krantz.

The moufflon, or musmon, though covered with hair, bears a stronger similitude to the ram than to any other animal: like the ram, it has the eyes placed near the horns, and its ears are shorter than those of the goat; it also resembles the ram in its horns, and in all the particular contours of its form. The horns also are alike; they are of a yellow colour; they have three sides, as in the ram, and bend backwards in the same manner behind the ears; the muzzle and the inside of the ears are of a whitish colour, tinctured with yellow; the other parts of the face are of a brownish gray. The general colour of the hair over the body is of a brown approaching to that of the red deer. The inside of the thighs and the belly are of a white, tinctured with yellow. The form, upon the whole, seems more made for agility and strength than that of the common sheep; and the moufflon is actually found to live in a savage state, and maintain itself, either by force or swiftness, against all the animals that live by rapine. Such is its extreme speed, that many have been inclined rather to rank it among the deer kind than the sheep. But in this they are deceived, as the musmon has a mark that entirely distinguishes it from that species, being known never to shed its horns. In some these are seen to grow to a surprising size; many of them measuring, in their convolutions, above two ells long. They are of a yellow colour, as was said; but the older the animal grows, the darker the horns become: with these they often maintain very furious battles between each other; and sometimes they are found broken off in such a manner, that the small animals of the forest creep into the cavity for shelter.[12] When the musmon is seen standing on the plain, his fore-legs are always straight, while his hinder legs seem bent under him; but in cases of more active necessity, this seeming deformity is removed, and he moves with great swiftness and agility. The female very much resembles the male of this species, but that she is less, and her horns also are never seen to grow to that prodigious size they are of in the wild ram. Such is the sheep in its savage state; bold, noble, and even beautiful animal: but it is not the most beautiful creatures that are always found most useful to man. Human industry has therefore destroyed its grace, to improve its utility.[13]

THE GOAT AND ITS VARIETIES.

There are some domestic animals that seem as auxiliaries to the more useful sorts; and that, by ceasing to be the first, are considered as nothing. We have seen the services of the ass slighted, because inferior to those of the horse; and in the same manner, those of the goat are held cheap, because the sheep so far exceeds it. Were the horse or the sheep removed from nature, the inferior kinds would then be invaluable; and the same arts would probably be bestowed in perfecting their kinds, that the higher order of animals have experienced. But in their present neglected state, they vary but little from the wild animals of the same kind: man has left them in their primitive habits and forms; and the less they owe to his assiduity, the more they receive from nature.

The goat seems, in every respect, more fitted for a life of savage liberty than the sheep.[14] It is naturally more lively, and more possessed with animal instinct. It easily attaches itself to man, and seems sensible of his caresses. It is also stronger and swifter, more courageous and more playful, lively, capricious, and vagrant; it is not easily confined to its flock, but chooses its own pastures, and loves to stray remote from the rest. It chiefly delights in climbing precipices, in going to the very edge of danger; it is often seen suspended upon an eminence hanging over the sea, upon a very little base, and even sleeps there in security. Nature has in some measure fitted it for traversing these declivities with ease; the hoof is hollow underneath, with sharp edges, so that it walks as securely on the ridge of a house as on the level ground. It is a hardy animal, and very easily sustained; for which reason it is chiefly the property of the poor, who have no pastures with which to supply it. Happily, however, it seems better pleased with the neglected wild than the cultivated fields of art; it chooses the heathy mountain, or the shrubby rock; its favourite food is the tops of boughs, or the tender bark of young trees; it seems less afraid of immoderate heat, and bears the warm climates better than the sheep; it sleeps exposed to the sun, and seems to enjoy its warmest fervours, neither is it terrified at the storm, or incommoded by the rain; immoderate cold alone seems to affect it, and is said to produce a vertigo, with which this animal is sometimes incommoded. The inconstancy of its nature is perceivable in the irregularity of its gait; it goes forward, stops, runs, approaches, flies, merely from caprice, and with no other seeming reason than the extreme vivacity of its disposition.

There are proofs of this animal's being naturally the friend of man; and that the goat seldom resumes its primeval wildness when once reduced into a state of servitude. In the year 1698, an English vessel happening to touch at the islands of Bonavista, two negroes came, and offered the sailors as many goats as they chose to take away. Upon the captain's expressing his astonishment at this offer, the negroes assured him that there were but twelve persons in the island, and that the goats were multiplied in such a manner as even to become a nuisance: they added, that instead of giving any trouble to catch them, they followed the few inhabitants that were left with a sort of obstinacy, and rather became importunate with their tameness.[14]

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[12] Gmelin, as quoted by Buffon.

[13] See Supplementary Note B, p. 317.

[14] Buffon.

The goat produces but two at a time, and three at the most. But in the warmer climates, although the animal degenerates, and grows less, yet it becomes more fruitful, being generally found to bring forth three, four, and five, at a single delivery. The buck is capable of propagating at the age of one year, and the female at seven months; however, the fruits of this premature generation are weak and defective; and their best breeding-time is generally delayed till the age of two years, or eighteen months at least. One buck is sufficient for a hundred and fifty goats; his appetites are excessive; but this ardour brings on a speedy decay, so that he is enervated in four years at most, and even becomes old before he reaches his seventh year. The goat, like the sheep, continues five months with young; and in some places bears twice a-year.

The milk of the goat is sweet, nourishing, and medicinal; not so apt to curdle upon the stomach as that of the cow; and, therefore, preferable to those whose digestion is but weak. The peculiarity of this animal's food gives the milk a flavour different from that either of the cow or the sheep; for as it generally feeds upon shrubby pastures and heathy mountains, there is an agreeable wildness in the taste, very pleasing to such as are fond of that aliment.[15] In several parts of Ireland, and the Highlands of Scotland, the goat makes the chief possession of the inhabitants. On those mountains, where no other useful animal could find subsistence, the goat continues to glean a sufficient living; and supplies the hardy natives with what they consider as varied luxury. They lie upon beds made of their skins, which are soft, clean, and wholesome; they live upon their milk, with oat bread; they convert a part of it into butter, and some into cheese; the flesh, indeed, they seldom taste of, as it is a delicacy which they find too expensive; however, the kid is considered, even by the city epicure, as a great rarity; and the flesh of the goat, when properly prepared, is ranked by some as no way inferior to venison. In this manner, even in the wildest solitudes, the poor find comforts of which the rich do not think it worth their while to dispossess them; in these mountainous retreats, where the landscape presents only a scene of rocks, heaths, and shrubs, that speak the wretchedness of the soil, these simple people have their feasts and their pleasures; their faithful flock of goats attends them to these awful solitudes, and furnishes them with all the necessaries of life; while their remote situation happily keeps them ignorant of greater luxury.

As these animals are apt to stray from the flock, no man can attend above fifty of them at a time. They are fattened in the same manner as sheep; but, taking every precaution, their flesh is never so good or so sweet, in our climate, as that of mutton. It is otherwise between the tropics. The mutton there becomes flabby and lean, while the flesh of the goat seems rather to improve; and in some places the latter is cultivated in preference to the former. We, therefore, find this animal in almost every part of the world, as it seems fitted for the necessities of man in both extremes. Towards the north, where the pasture is coarse and barren, the goat is fitted to find a scanty subsistence; between the tropics, where the heat is excessive, the goat is fitted to bear the climate, and its flesh is found to improve.

One of the most remarkable varieties we find in the goat is in that of Natolia. The Natolian goat, or, as Mr. Buffon calls it, the goat of Angora, has the ears longer than ours, and broader in proportion. The male has horns of about the same length with the goat of Europe, but black, and turned very differently, going out horizontally on each side of the head, and twisted round in the manner of a cork-screw. The horns of the female are shorter, and encircle the ear somewhat like those of the ram. They are of a dazzling white colour, and in all the hair is very long, thick, fine, and glossy; which, indeed, is the case with almost all the animals of Syria. There are a great number of these animals about Angora, where the inhabitants drive a trade with their hair, which is sold, either raw or manufactured, into all parts of Europe. Nothing can exceed the beauty of the stuffs which are made from the hair of almost all the animals of that country. These are well known among us by the name of camlet.

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[14] M. Sonini, in his edition of Buffon's Natural History, has given us a curious instance of the readiness with which the goat will permit itself to be sucked by animals of a different kind, and far larger size than itself. He assures us, that he saw, in the year 1780, a foal that had lost its mother, thus nourished by a goat, which was placed on a barrel, in order that the foal might suck with greater convenience. The foal followed his nurse to pasture, as it would have done its parent; and was attended with the greatest care by the goat, which always called it back by her bleatings when it wandered to any distance from her.—Ed.

[15] An Englishman, on visiting the Mediterranean countries, and finding goat's milk nearly everywhere in use, to the exclusion of that of the cow, is apt to ascribe it to prejudice; but, on farther research, he finds that it is more digestible than cow's milk, and hence more suitable to warm countries; and that a greater amount of milk can be obtained from a given space of ground pastured by goats than when pastured by cows, in consequence of the goat feeding upon many things the cow either would not taste or that would prove poisonous to her. The Malta goat frequently gives ten pints of milk per day in the height of the milking; while in the case where a milch cow was required at Smyrna, several herds were tried, and the greatest quantity procurable was two pints per day from a single cow. In many parts of Australia, therefore, (particularly in the bushy ground near Sydney,) goats might with great advantage supplant the cows for milking purposes; while the flesh of some of the breeds, differing little from mutton, would still farther enhance their value." —*Hints to Australian Emigrants.*

A second variety is the Assyrian goat of Gesner, which is somewhat larger than ours, with ears almost hanging down to the ground, and broad in proportion.[16] The horns, on the contrary, are not above two inches and a half long, black, and bending a little backwards. The hair is of a fox colour, and under the throat there are two excrescences, like the gills of a cock. These animals are chiefly kept round Aleppo, for the sake of their milk. They are driven through the streets, and their milk is sold to the inhabitants as they pass along.

In the third variety may be reckoned the little goat of America, which is of the size of a kid, but the hair is as long as that of the ordinary breed. The horns, which do not exceed the length of a man's finger, are thick, and bent downwards so close to the head, that they almost enter the skin.

There is an animal of this kind at the Cape of Good Hope, called the blue goat, which may be ranked as the fourth variety. It is in shape like the domestic, but much larger, being nearly of the size of a stag. Its hair is very short, and of a delightful blue; but it loses a great deal of its beauty when the animal is dead. It has a very long beard; but the horns are not so long in proportion as in other goats, being turned spirally, in the manner of a cork-screw. It has very long legs, but well-proportioned, and the flesh is very well tasted, but lean. For this reason, in that plentiful country it is chiefly killed upon account of its skin. It is a very shy animal, and seldom comes near the Dutch settlements; but they are found in great abundance in the more uncultivated parts of the country. Besides these, they are found in this extensive region of various colours, and many of them are spotted beautifully, with red, white, and brown.[17]

In fine, the Juda goat resembles ours in most parts except in size, it being much smaller. This animal is common in Guinea, Angola, and all along the coasts of Africa; it is not much larger than a hare, but it is extremely fat, and its flesh admirably tasted. It is in that country universally preferred to mutton.

These animals seem all of one kind, with very trifling distinctions between them. It is true that they differ in some respects; such as having neither the same colour, hair, ears, or horns. But it ought to be considered as a rule in natural history, that neither the horns, the colour, the fineness or the length of the hair, or the position of the ears, are to be considered as making an actual distinction in the kinds. These are accidental varieties produced by climate and food, which are known to change even in the same animal, and give it a seeming difference of form. When we see the shapes, the inclinations, and the internal conformation of seemingly different creatures nearly the same; and, above all, when we see them producing among each other, we then have no hesitation in pronouncing the species, and asserting that these are of the goat kind, with which they are so materially connected.[18]

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[16] M. Sonini assures us, that though the ears of this variety are much longer than those of the common goat, they never reach so low as the ground, nor, as has been reported, are they ever cropped.—Ed.

[17] This species is now known to be of the antelope tribe, and is, by all modern zoological writers, called the blue antelope.—Ed.

[18] It would be difficult, if not impossible, to substantiate the descent of the present domestic breeds of goats from any one particular species still found in a state of nature, if the probabilities were not that two, at least, if not all, have served for that purpose, or have subsequently intermixed with them; for although the characters of the horns are in this genus sufficiently diversified, they retain, nevertheless, a clear typical structure, even in the Jemlah species, and the several races, however debased by domesticity, resume more or less of the normal form, when restored to their original independence under congenial circumstances. The genus capra is distinguished from antelope by the osseous nucleus of the horns being partially porous or cellular, communicating with the sinus of the frontals. The direction of the horns is upwards, bending to the rear, more or less angular, compressed, nodose, and transversely wrinkled; they are common to both sexes, but smaller, less angular, and straighter in the females; the line of the forehead and chaffron is rather convex; the eye of a light brown or yellowish colour, with a lengthened dark pupil, has a lively and independent expression; there is no suborbital or lachrymary opening beneath the eye; the nose is without a muzzle, leaving only a narrow naked space between the nostrils; a beard adorns the chin of nearly all the males; the ears are narrow and rather rounded at the tips; the tail is short, naked below, often carried in an elevated position, and the fur is not very coarse, but of different lengths and colours, and accompanied beneath by a close woolly down; the legs are strong and thick, with a small callosity on the carpus instead of a brush; the hoofs are high and solid, supporting rigid perpendicular pasterns. The females are furnished with two mammæ, forming an udder; their time of gestation is five months, and the young female is capable of propagating at seven months old: two kids are usually produced at a birth. The male requires one year to develope his faculties, and one is sufficient for a flock of one hundred goats; but at six years of age he is already old, though the life of this genus extends to fifteen. At all times, but more particularly during the rutting season, the males emit a powerful smell; they are libidinous, and contend for the possession of the females by butting with their horns, not in the manner of the stag or bull, by running low at each other, but by standing on the hind legs and striking with their whole

But although these are evidently known to belong to the goat kind, there are others nearly resembling the goat, of whose kindred we cannot be equally certain. These are such as, being found in a state of nature, have not as yet been sufficiently subjected to human observation. Hence it is impossible to determine with precision to which class they belong; whether they be animals of a particular kind, or merely the goat in its state of savage freedom. Were there but one of these wild animals, the inquiry would soon be ended, and we might readily allow it for the parent stock; but, in the present case, there are two kinds that have almost equal pretensions to this honour; and the claims of which it has been found difficult to determine. The animals in question are the chamois and the ibex. These both bear very near approaches to the goat in figure; have horns that never shed; and, at the same time, are more different from each other than from the animal in question. From which of these two sources our domestic goat is derived is not easy to settle. Instead, therefore, of entering into the discussion, I will content myself with the result of Mr. Buffon's inquiries. He is of opinion that the ibex is the principal source; that our domestic goat is the immediate descendant; and that the chamois is but a variety from that stock, a sort of collateral branch of the same family. His principal reason for giving the preference to the ibex is, its having a more masculine figure, large horns, and a large beard; whereas the chamois wants these marks of primitive strength and wildness. He supposes, therefore, in their original savage state, that our goat has taken after the male of the parent stock, and the chamois after the female: and that this has produced a variety in these animals even before they underwent human cultivation.

However this be, the two animals in question seem both well-fitted for their precarious life, being extremely swift, and capable of running with ease along the ledges of precipices, where even the wolf or the fox, though instigated by hunger, dares not pursue them. They are both natives of the Alps, the Pyrenees, and the mountains of Greece; there they propagate in vast numbers, and continue to exist in spite of the hunter and every beast of prey that is found incessantly to pursue them.

The ibex resembles the goat in the shape of its body; but differs in the horns, which are much larger. They are bent backward, full of knots; and it is generally asserted that there is a knot added every year. There are some of these found, if we may believe Bellonius, at least two yards long. The ibex has a large black beard, is of a brown colour, with a thick warm coat of hair. There is a streak of black runs along the top of the back; and the belly and back of the thighs are of a fawn colour.[19]

ANIMALS OF THE ANTELOPE KIND.[20]

THE chamois,[21] though a wild animal, is very easily tamed, and docile; and to be found only in rocky and mountainous places. It is about the size of a domestic goat, and resembles one in many respects. It is most agreeably lively, and active beyond expression. The chamois hair is short, like that of the doe; in spring, it is of an ash colour; in autumn, a dun colour, inclining to black; and in winter, of a blackish brown. This animal is found in great plenty in the mountains of Dauphiny, of Piedmont, Savoy, Switzerland, and Germany. They are peaceful, gentle creatures, and live in society with each other. They are found in flocks of from four to fourscore, and even a hundred, dispersed upon the crags of the mountains. The large males are

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weight obliquely downwards, during these conflicts they mutter abruptly, lick their lips, and paw the ground.

Goats are by nature inclined to ascend: in a wild state all the species reside on the most elevated mountains upon the borders of perpetual snow; and the domesticated, if they live in mountainous countries, will climb invariably, while feeding, till the necessity of drinking, or the habits of education again call them down. When mixed with sheep, they always take the lead, and the more helpless species follow their track. They are fearless, capricious, impudent, gregarious, not disinclined to associate even with man, but always in motion, ever in search of new objects, persevering yet inconstant. They spring with precision on the most difficult ground, love to look over precipices, and to perch on the highest accessible pinnacles. They walk on narrow ledges of rocks, and if two meet in such a place that neither can turn, one lies down, and the other passes over its back. Their senses are acute, they see to a great distance, and the faculty of smelling is very delicate; but in the choice of their food they are not difficult, often preferring bitter plants, Euphorbia, Cicuta, and even manufactured tobacco, barking the trees and buds, and doing great mischief to the woods. None of the species are large in stature, but their structure is robust, and their habits vigilant. The wild species can mount a perpendicular surface, fifteen feet high, at three leaps, or rather three successive bounds of five feet each, if the slightest rugosity will suffer the renewals of ascending force, while the original impulse is still sufficient to retain the given direction. Between two perpendicular rocks, close together, they mount by alternate bounds from one to the other. In cases of fear, their voice is a short sharp whistle, stronger than the chamois; at other times it is a snort; when threatening, as we have said, a broken spluttering sound; and when young they bleat. The females are attentive and affectionate to their young, and will defend them against wolves and eagles.—ED.

[19] See Supplementary Note C, p. 321.

[20] Without altering Goldsmith's text, we have thought proper to make the above division in his chapter 'Of Animals of the Sheep and Goat kind,' as the chamois and gazelles described in the following pages constitute mere species of the numerous tribe of Antelopes, a genus which has now obtained among naturalists a rank for themselves. See Supplementary Note D, p. 321.—ED.

[21] M. Peroud's Account as quoted by Buffon.

seen feeding detached from the rest, except in rutting time, when they approach the females, and drive away the young. The time of their coupling is from the beginning of October to the end of November; and they bring forth in March and April. The young keeps with the dam about five months, and sometimes longer, if the hunters and the wolves do not separate them. It is asserted that they live between twenty and thirty years. Their flesh is good to eat; and they are found to have ten or twelve pounds of suet, which far surpasses that of the goat in hardness and goodness. The chamois has scarcely any cry, as most animals are known to have; if it has any, it is a kind of feeble bleat, by which the parent calls its young. But in cases of danger, and when it is to warn the rest of the flock, it uses a hissing noise, which is heard at a great distance. For it is to be observed, that this creature is extremely vigilant, and has an eye the quickest and most piercing in nature. Its smell also is not less distinguishing. When it sees its enemy distinctly, it stops for a moment, and then, if the person be near, in an instant after it flies off. In the same manner, by its smell, it can discover a man at half-a-league distance, and gives the earliest notice. Upon any alarm, therefore, or any apprehension of danger, the chamois begins his hissing note with such force, that the rocks and the forests re-echo to the sound. The first hiss continues as long as the time of one inspiration. In the beginning it is very sharp, and deeper towards the close. The animal having, after this first alarm, reposed a moment, again looks round, and perceiving the reality of its fears, continues to hiss by intervals, until it has spread the alarm to a very great distance. During this time, it seems in the most violent agitation; it strikes the ground with its fore-foot, and sometimes with both; it bounds from rock to rock; it turns and looks round; it runs to the edge of the precipice, and, still perceiving the enemy, flies with all its speed. The hissing of the male is much louder and sharper than that of the female; it is performed through the nose; and is properly no more than a very strong breath driven violently through a small aperture. The chamois feeds upon the best herbage, and chooses the most delicate parts of the plants, the flower, and the tender buds. It is not less delicate with regard to several aromatic herbs which grow upon the sides of the mountains. It drinks but very little while it feeds upon the succulent herbage, and chews the cud in the intervals of feeding. This animal is greatly admired for the beauty of its eyes, which are round and sparkling, and which mark the warmth of its constitution. Its head is furnished with two small horns, of about half-a-foot long, of a beautiful black, and rising from the forehead, almost betwixt the eyes. These, contrary to what they are found in other animals, instead of going backwards or sideways, jet out forward, and bend a little, at their extremities, backward, in a small circle, and end in a very sharp point. The ears are placed, in a very elegant manner, near the horns; and there are two stripes of black on each side of the face, the rest being of a whitish yellow, which never changes. The horn of this animal is often used as the head of a cane. Those of the female are less, and not so much bent; and some farriers are seen to bleed cattle with them. These animals are so much incommoded by heat, that they are never found in summer, except in the caverns of rocks, amidst fragments of unmelted ice, under the shade of high and spreading trees, or of rough and hanging precipices, that face the north, and which keep off entirely the rays of the sun. They go to pasture both morning and evening, and seldom during the heat of the day. They run along the rocks with great ease and seeming indifference, and leap from one to another, so that no dogs are able to pursue them. There is nothing more extraordinary than to see them climbing and descending precipices, that to all other quadrupeds are inaccessible. They always mount or descend in an oblique direction; and throw themselves down a rock of thirty feet, and light with great security upon some excrescence or fragment, on the side of the precipice, which is just large enough to place their feet upon; they strike the rock, however, in their descent, with their feet, three or four times, to stop the velocity of their motion; and, when they have got upon their base below, they at once seem fixed and secure. In fact, to see them jump in this manner, they seem rather to have wings than legs: some, indeed, pretend to say, that they use their horns for climbing; but this wants confirmation. Certain it is that their legs alone are formed for this arduous employment, the hinder being rather longer than the former, and bending in such a manner, that when they descend upon them, they break the force of the fall. It is also asserted, that when they feed, one of them always stands as sentinel; but how far this may be true is questionable. For certain, while they feed there are some of them that keep continually gazing round the rest; but this is practised among all gregarious animals; so that when they see any danger, they warn the rest of the herd of its approach. During the rigours of winter, the chamois sleeps in the thicker forests, and feeds upon the shrubs and the buds of the pine tree. It sometimes turns up the snow with its foot to look for herbage, and where it is green makes a delicious repast. The more craggy and uneven the forest, the more this animal is pleased with the abode, which thus adds to its security. The hunting the chamois is very laborious, and extremely difficult. The most usual way is to hide behind the clefts of the rocks, and shoot them. This, however, must be done with great precaution; the sportsman must creep for a vast way upon his belly in silence, and take also the advantage of the wind, which if it blow from him they would instantly perceive. When arrived at a proper distance, he then advances his piece, which is to be rifle-barrelled, and to carry one ball, and tries his fortune among them. Some also pursue this animal as they do the stag, by placing proper persons at all the passages of a glade or valley, and then sending in others to rouse the game. Dogs are quite useless in this chase, as they rather alarm than overtake. Nor is it without danger, even to the men, for it often happens that when the animal finds itself over-pressed, it drives at the hunter with its head, and often tumbles him down the neighbouring precipice.[22] This animal cannot go upon ice when smooth ; but if there be the least inequalities on its surface, it then bounds along in security, and quickly evades all pursuit.

The skin of the chamois was once famous, when tanned, for its softness and warmth ; at present, however, since the art of tanning has been brought to greater perfection, the leather called *shammoy* is made also from those of the tame goat, the sheep, and the deer. Many medicinal virtues also were said to reside in the blood, fat, gall, and the concretion sometimes found in the stomach of this animal called the *German bezoar*. The fat, mixed with milk, was said to be good in ulcers of the lungs. The gall was said to be useful in strengthening the sight ; the stone, which is generally about the size of a walnut, and blackish, was formerly in great request for having the same virtues with oriental bezoar. However, in the present enlightened state of physic, all these medicines are quite out of repute ; and although we have the names of several medicines procurable from quadrupeds, yet, except the musk or hartshorn alone, I know of none in any degree of reputation. It is true, the fat, the urine, the beak, and even the dung of various animals, may be found efficacious, where better remedies are not to be had ; but they are far surpassed by many at present in use, whose operations we know, and whose virtues are confirmed by repeated experience.

Such are the quadrupeds that more peculiarly belong to the goat kind. Each of these, in all probability, can engender and breed with the other ; and were the whole race extinguished, except any two, these would be sufficient to replenish the world, and continue the kind. Nature, however, proceeds in her variations by slow and insensible degrees, and scarcely draws a firm distinguished line between any two neighbouring races of animals whatsoever. Thus, it is hard to discover where the sheep ends, and the goat begins ; and we shall find it still harder to fix precisely the boundaries between the goat kind and the deer. In all transitions from one kind to the other, there are to be found a middle race of animals that seem to partake of the nature of both, and that can precisely be referred to neither. That race of quadrupeds, called the *gazelles*, are of this kind ; they are properly neither goat nor deer, and yet they have many of the marks of both ; they make the shade between these two kinds, and fill up the chasm in nature.

THE GAZELLES.

The gazelles, of which there are several kinds, can, with propriety, be referred neither to the goat nor the deer, and yet they partake of both natures. Like the goat they have hollow horns that never fall, which is otherwise in the deer. They have a gall-bladder which is found in the goat, and not in the deer, and, like that animal, they feed rather upon shrubs than grassy pastures. On the other hand, they resemble the roe-buck in size and delicacy of form ; they have deep pits under the eyes like that animal ; they resemble the roe-buck in the colour and nature of their hair ; they resemble him in the bunches upon their legs, which only differ in being upon the fore-legs in these, and on the hind-legs in the other. They seem, therefore, to be of a middle nature between these two kinds ; or, to speak with greater truth and precision, they form a distinct kind by themselves.

The distinguishing marks of this tribe of animals, by which they differ both from the goat and the deer, are these ; their horns are made differently, being annulated or ringed round, at the same time that there are longitudinal depressions running from the bottom to the point. They have bunches of hair upon their fore-legs ; they have a streak of black, red, or brown, running along the lower part of their sides, and three streaks of whitish hair in the internal side of the ear. These are characters that none of them are without ; besides these, there are others which, in general, they are found to have, and which are more obvious to the beholder. Of all animals in the world, the gazelle has the most beautiful eye, extremely brilliant, and yet so meek, that all the eastern poets compare the eyes of their mistresses to those of this animal. A gazelle-eyed beauty is considered as the highest compliment that a lover can pay; and, indeed, the Greeks themselves thought it no inelegant piece of flattery to resemble the eyes of a beautiful woman to those of a cow. The gazelle, for the most part, is more delicately and finely limbed than even the roebuck; its hair is as short, but finer and more glossy. Its hinder legs are longer than those before, as in the hare, which gives it greater security in ascending or descending steep places. Their swiftness is equal, if not superior, to that of the roe; but as the latter bounds forward, so these run along in an even uninterrupted course. Most of them are brown upon the back, white under the belly, with a black stripe separating those colours between. Their tail is of various lengths, but in all covered with pretty long hair; and their ears are beautiful, well placed, and terminating in a point. They all have a cloven hoof, like the sheep; they all have permanent horns; and the female has them smaller than the male.

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[22] "And yet with the full knowledge of the dangers to be encountered, the chase of the chamois is the object of an insurmountable passion. Saussure knew a handsome young man, of the district of Chamouni, who was about to be married ; and the adventurous hunter thus addressed the naturalist:—'My grandfather was killed in the chase of the chamois ; my father was killed also ; and I am so certain that I shall be killed myself, that I call this bag, which I always carry hunting, my winding sheet : I am sure that I shall have no other ; and yet if you were to offer to make my fortune, upon the condition that I should renounce the chase of the chamois, I should refuse your kindness.' Saussure adds, that he went several journeys in the Alps with this young man ; that he possessed astonishing skill and strength ; but that his temerity was greater than either ; and that two years afterwards he met the fate which he anticipated, by his foot failing on the brink of a precipice to which he had leaped. It is the chase itself which attracts these people, more than the value of the prey ; it is the alternation of hope and fear—the continual excitement—the very dangers themselves—which render the chamois-hunter indifferent to all other pleasures."—*Menageries*, vol. i.

Of these animals Mr. Buffon makes twelve varieties; which, however, is much fewer than what other naturalists have made them. The first is the *gazella*, properly so called, which is of the size of the roebuck, and very much resembling it in all the proportions of its body, but entirely differing, as was said, in the nature and fashion of the horns, which are black and hollow, like those of the ram or the goat, and never fall. The second he calls the *kevel*, which is rather less than the former; its eyes also seem larger; and its horns, instead of being round, are flatted on the sides, as well in the male as the female. The third he calls the *corin*, which very much resembles the two former, but that it is still less than either. Its horns also are smaller in proportion, smoother than those of the other two, and the annular prominences belonging to the kind are scarcely discernible, and may rather be called wrinkles than prominences. Some of these animals are often seen streaked like the tiger. These three are supposed to be of the same species. The fourth he calls the *seiran*, the horns only of which he has seen; which, from their size, and the description of travellers, he supposes to belong to a larger kind of the gazelle, found in India and Persia, under that denomination.

The fifth he calls the *koba*, and the sixth the *kob;* these two differ from each other only in size, the former being much larger than the latter. The muzzle of these animals is much longer than those of the ordinary gazelle; the head is differently shaped, and they have no depressions under the eyes. The seventh he calls after its Egyptian name, the *algazel;* which is shaped pretty much like the ordinary gazelle, except that the horns are much longer, being generally three feet from the point to the insertion; whereas, in the common gazelle, they are not above a foot; they are smaller also, and straighter, till near the extremities, when they turn short, with a very sharp flexure; they are black and smooth, and the annular prominences are scarcely observable. The eighth is called the *pazan;* or, by some, the *bezoar goat*, which greatly resembles the former, except a small variety in their horns; and also with this difference, that as the algazel feeds upon the plains, this is only found in the mountains. They are both inhabitants of the same countries and climate; being found in Egypt, Arabia, and Persia. This last is the animal famous for that concretion in the intestines or stomach, called the *oriental bezoar*, which was once in such repute all over the world for its medicinal virtues. The word *bezoar* is supposed to take its name either from the pazan or pazar, which is the animal that produces it; or from a word in the Arabic language, which signifies *antidote* or *counter-poison*. It is a stone of a glazed blackish colour, found in the stomach or the intestines of some animal, and brought over to us from the East Indies. Like all other animal concretions, it is found to have a kind of nucleus, or hard substance within, upon which the external coatings were formed; for, upon being sawed through, it is seen to have layer over layer, as in an onion. This nucleus is of various kinds; sometimes the buds of a shrub, sometimes a piece of stone, and sometimes a marcasite. This stone is from the size of an acorn to that of a pigeon's egg; the larger the stone, the more valuable it is held; its price increasing, like that of a diamond. There was a time when a stone of four ounces sold in Europe for above two hundred pounds; but at present the price is greatly fallen, and they are in very little esteem. The bezoar is of various colours; sometimes of a blood colour, sometimes of a pale yellow, and of all the shades between these two. It is generally glossy, smooth, and has a fragrant smell, like that of ambergris, probably arising from the aromatic vegetables upon which the animal that produces it feeds. It has been given in vertigoes, epilepsies, palpitations of the heart, colic, and jaundice; and in those places where the dearness, and not the value of medicines is consulted, in almost every disorder incident to man. In all, perhaps, it is equally efficacious, acting only as an absorbent powder, and possessing virtues equal to common chalk, or crabs-claws. Judicious physicians have therefore discarded it; and this celebrated medicine is now chiefly consumed in countries where the knowledge of nature has been but little advanced. When this medicine was in its highest reputation, many arts were used to adulterate it; and many countries endeavoured to find out a bezoar of their own. Thus we had occidental bezoar, brought from America; German bezoar, which has been mentioned before; cow bezoar; and monkey bezoar. In fact, there is scarcely an animal, except of the carnivorous kinds, that does not produce some of these concretions in the stomach, intestines, kidneys, bladder, and even in the heart. To these ignorance may impute virtues that they do not possess; experience has found but few cures performed by their efficacy: but it is well known, that they often prove fatal to the animal that bears them. These concretions are generally found in cows, by their practice of licking off their hair, which gathers in the stomach into the shape of a ball, acquires a surprising degree of hardness, and sometimes a polish like leather. They are often as large as a goose-egg; and when become too large to pass, block up the passage of the food, and the animal dies. The substance of these balls, however, is different from the bezoar mentioned above; being rather a concretion of hair than of stone. There is a bezoar found in the gall-bladder of a boar, and thence called *hog bezoar*, in very great esteem; but perhaps with as little justice as any of the former. In short, as we have already observed, there is scarcely an animal, or scarcely a part of their bodies, in which concretions are not formed; and it is more than probable, as Mr. Buffon justly remarks, that the bezoar so much in use formerly, was not the production of the pazar, or any one animal only, but that of the whole gazelle kind; who feeding upon odoriferous herbs and plants gave this admirable fragrance to the accidental concretions which they were found to produce. As this medicine, however, is but little used at present, our curiosity is much abated as to the cause of its formation. To return, therefore, to the varieties in the gazelle tribe, the ninth is called the *ranguer*, and is a native of Senegal. This differs somewhat in shape and colour from the rest; but particularly in the shape of its horns, which are straight to near the points, where they crook forward, pretty much in the same manner as in the chamois they crook backward. The tenth variety of the gazelle is the *antelope*, so well known to the English, who have given it the name. This animal is of the size of a roe-buck, and resembles the gazelle in many particulars, but differs in others: it has deeper eye-pits than the former; the horns are formed differently also, being about sixteen inches long, almost touching each other at the bottom, and spreading as they rise, so as at their tips to be sixteen inches asunder. They have the annular prominences of their kind, but not so distinguishable as in the gazelle; however, they have a double flexure, which is very remarkable, and serves to distinguish them from all others of their kind. At the root they have a tuft of hair, which is longer than that of any part of the body. Like others of the same kind, the antelope is brown on the back, and white under the belly; but these colours are not separated by the black streak which is to be found in all the rest of the gazelle kinds. There are different sorts of this animal, some with larger horns than others, and others with less. The one which makes the eleventh variety in the gazelle kind, Mr. Buffon calls the *lidme*, which has very long horns; and the other, which is the twelfth and last, he calls the *Indian antelope*, the horns of which are very small.[23]

[23] The common or Indian antelope is smaller than the fallow-deer, with a lengthened head, ending in a rather full and round mouth, surmounted by a small moist muzzle; the eyes are full, soft, and dark-hazel, with a well-defined suborbital opening beneath; the ears middle-sized and pointed; and the horns, placed a little above the orbits, are from fifteen to twenty inches long, which, as the animal advances in age, become more and more spiral, though when younger they have little more than three flexures. They begin to appear on the young males at the age of seven months, showing the second year one slight bend, increasing the spiral curve when they have two, which takes place at three years of age, and twelve or thirteen rings are numbered on their surface; but when they have attained three years, they contain about twenty-two complete rings. In more advanced age they thicken, at the base a succession of half annuli or wrinkles are seen, and they are sometimes two feet long; the spiral turns are then perfect, so that after death, if the osseous core within be dry, they can be screwed on and off with ease. The colours of the hair vary likewise with age: while young they are of a pale fulvous, more or less ochery, with white about the mouth, inside of the ears, breast, belly, inside of the limbs, buttocks, anterior part of the thighs, interior and posterior part of the upper arms, and the rest of the legs; a white streak passes also about midway of the fulvous along the flanks; there is sometimes a dark streak in the form of a crescent passing round the anterior part of the eyes next the forehead; when older, the white increases on the nose, forms a circle round the orbits, extends on the lower jaw and throat, and the legs often become entirely white, excepting the tufts on the knees, which are always brown; the tail about five inches long, is likewise white beneath, brown or fulvous above, and without a tuft at the end. But the fulvous colours darken gradually, the forehead, back of the ears, top of the neck, superior part of the tail, and the middle and lower part of the thigh, to beneath the joint, alone remain fulvous; the chaffron, cheeks, throat, sides of the neck, shoulders, back, croup, and flanks, deepening into a sepia-brown, and the streak on the middle of the flanks becomes intense black, with a second of the same colour some inches lower on the edge of the white colour of the belly. It is at this period that the colouring is complete, and the term *spotted* is applied; they are then of a growth and maturity to claim a herd of females, but there are individuals, and they are the most vigorous, which become nearly all shining black and white, the fulvous being wholly obliterated; these have the horns wrinkled and solid as before noticed, and never more than one male so marked is seen in a herd, the leader and champion of the females and the young. This species resides in India in herds of fifty or sixty does or females, led by a dark-coloured buck. They remain invariably on the open plains, so as to see danger from a distance. Captain Williamson and other sportsmen state, that when a herd is collected to lie down and ruminate on some favourite spot, the young males and some females are detached two or three hundred yards each way to keep watch, especially if there be clumps of grass or bushes, behind which a man might lurk unseen, except for such a precaution. "It is folly," continues this well-informed sportsman, "to slip grey-hounds after them, for excepting, by surprise, success is not to be expected, but perhaps, at

To these may be added three or four varieties more, which it is not easy to tell whether to refer to the goat or the gazelle, as they equally resemble both. The first of these is the *bubalus*, an animal that seems to partake of the mixed natures of the cow, the goat, and the deer. It resembles the stag in the size and the figure of its body, and particularly in the shape of its legs. But it has permanent horns, like the goat; and made entirely like those of the gazelle kind. It also resembles that animal in its way of living; however, it differs in the make of its head, being exactly like the cow in the length of its muzzle, and in the disposition of the bones of its skull; from which similitude it has taken its name. This animal has a narrow long head; the eyes are placed very high; the forehead short and narrow; the horns permanent, about a foot long, black, thick, annulated, and the rings of the gazelle kind, remarkably large; its shoulders are very high, and it has a kind of bunch on them, that terminates at the neck; the tail is about a foot long, and tufted with hair at the extremity. The hair of this animal is remarkable in being thicker at the middle than at the root: in all other quadrupeds, except the elk and this, the hair tapers off from the bottom to the point; but in these each hair seems to swell in the middle, like a nine-pin. The bubalus also resembles the elk in size, and the colour of its skin; but these are the only similitudes between them; as the one has a very large branching head of solid horns that are annually deciduous, the other has black, unbranching, hollow horns, that never fall. The bubalus is common enough in Barbary, and has often been called by the name of the *Barbary cow*, from which animal it differs so widely. It partakes pretty much of the nature of the antelope; like that, having the hair short, the hide black, the ears pointed, and the flesh good for food.

The second anomalous animal of the goat kind, Mr. Buffon calls the *condoma*.[24] It is supposed to be equal in size to the largest stag, but with hollow horns, like those of the goat kind, and with varied flexures, like those of the antelope. They are above three feet long; and at their extremities about two feet asunder. All along the back there runs a white list, which ends at the insertion of the tail; another of the same colour crosses this, at the bottom of the neck, which it entirely surrounds; there are two more of the same kind running round the body, one behind the fore-legs, and the other running parallel to it before the hinder. The colour of the rest of the body is grayish, except the belly, which is white: it has also a long gray beard; and its legs, though long, are well proportioned.

The third that may be mentioned, he calls the *guiba*. It resembles the gazelle in every particular, except in the colour of the belly, which, as we have seen, is white in them, but in this is of a deep brown. Its horns also are not marked with angular prominences, but are smooth and polished. It is also remarkable for white lists, on a brown ground, that are disposed along the animal's body, as if it were covered with harness. Like the former it is a native of Africa.

The *African wild goat* of Grimmius is the fourth. It is of a dark ash-colour; and in the middle of the head is a hairy tuft, standing upright; on both sides, between the eyes and the nose, there are very deep cavities, greater than those of the other kinds, which contain a yellow oily liquor, coagulating into a black substance, that has a smell between musk and civet. This being taken away, the liquor again runs out, and coagulates, as before. These cavities have no communication with the eyes, and, consequently, this oozing substance can have nothing of the nature of tears.

To this we may add the *chevrotin*, or little Guinea deer, which is the least of all cloven-footed quadrupeds, and perhaps the most beautiful; its legs, at the smallest part, are not much thicker than the shank of a tobacco pipe; it is about seven inches high, and about twelve from the point of the nose to the insertion of the tail. It is the most delicately shaped animal in the world, being completely formed like a stag in miniature; except that its horns, when it has

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the expense of their lives." The height and distance of their bounds are wonderful, and said to be at least twelve feet from the ground, and over twenty-five or thirty feet of space, and as it were for their own amusement, appearing to deride such dogs as follow them. The chase, therefore, as an amusement (for the venison is dry and lean) is conducted by the Mahomedan and Hindoo princes, with hawks who fly at and fix their talons on the head and throat of the quarry, till the dogs can come up; or with the cheetah, by surprise, as is also practised in Persia. They are found over the whole peninsula of India, to the northward and westward as far as the Indus; but as they do not resort to the sandy deserts, it is probable that they extend along the more fertile uplands of the Persian gulf, particularly as we have been assured that our Indian travellers met them near Basora, on their way home over land.—Ed.

[24] The *condoma*, or striped antelope, is a beautiful, tall animal, inhabiting the Cape of Good Hope; has long, slender shanks; is larger, though not so clumsy, as the elk antelope. Its horns are smooth, twisted spirally, with a prominent edge or rib following the wreaths; they are three feet nine inches long, of a pale brown colour, close at the base, and at the points round and sharp. The colour of this animal is a rusty brown; along the ridge of the back there is a white stripe mixed with brown; from this are eight or nine white stripes, pointing downwards; the forehead and fore part of the nose are brown; a white stripe runs from the corner of each eye, and meets just above the nose; upon each cheek-bone there are two small white spots; the inner edges of the ears are covered with white hair, and the upper part of the neck is adorned with a brown mane, an inch long; beneath the neck, from the throat to the breast, are some long hairs hanging down; the breast and belly are gray; the tail is two feet long, brown above, white beneath, and black at the end. The striped antelope, though a tall and slender animal, is not so swift as many of the gazelle kind, and is easily overtaken by the hounds.—Ed.

any, are more of the gazelle kind, being hollow and annulated in the same manner. It has two canine teeth in the upper jaw; in which respect it differs from all other animals of the goat or deer kind, and thus makes a species entirely distinct by itself. This wonderful animal's colour is not less pleasing; the hair, which is short and glossy, being in some of a beautiful yellow, except on the neck and belly, which is white. They are natives of India, Guinea, and the warm climates between the tropics, and are found in great plenty. But though they are amazingly swift for their size, yet the negroes often overtake them in the pursuit, and knock them down with their sticks. They may be easily tamed, and then they become familiar and pleasing; but they are of such delicate constitutions, that they can bear no climate but the hottest; and they always perish with the rigours of ours, when they are brought over. The male in Guinea has horns; the female is without any; as are all the kinds of this animal, to be found either in Java or Ceylon, where they chiefly abound.[25]

Such is the list of the gazelles: all which pretty nearly resemble the deer in form and delicacy of shape; but have the horns hollow, single, and permanent, like those of the goat. They properly fill up, as has been already observed, the interval between these two kinds of animals; so that it is difficult to tell where the goat ends, and the deer may be said to begin. If we compare the gazelles with each other, we shall find but very slight distinctions between them. The turn or the magnitude of the horns, the different spots on the skin, or a difference of size in each, are chiefly the marks by which their varieties are to be known; but their way of living, their nature, and their peculiar swiftness, all come under one description.

The gazelles are, in general, inhabitants of the warmer climates; and contribute, among other embellishments, to add beauty to those forests that are for ever green. They are often seen feeding in herds, on the side of the mountains, or in the shade of the woods; and fly altogether, upon the smallest approaches of danger. They bound with such swiftness, and are so very shy, that dogs or men vainly attempt to pursue them. They traverse those precipices with ease and safety, which to every quadruped else are quite impracticable; nor can any animal but of the winged kind overtake them.[26] Accordingly in all those countries where they are chiefly found, they are pursued by falcons; and this admirable manner of hunting makes one of the principal amusements of the upper ranks of people all over the East. The Arabians, Persians, and Turks, breed up for this purpose that kind of hawk called the *falcon gentle*, with which, when properly trained, they go forth on horseback among the forests and the mountains, the falcon perching upon the hand of the hunter. Their expedition is conducted with profound silence; their dogs are taught to hang behind; while the men, on the fleetest coursers, look round for the game. Whenever they spy a gazelle at the proper distance, they point the falcon to its object, and encourage it to pursue. The falcon, with the swiftness of an arrow, flies to the animal, that, knowing its danger, endeavours, but too late, to escape. The falcon soon coming up with its prey, fixes its talons, one into the animal's cheek, the other into its throat, and deeply wounds it. On the other hand, the gazelle attempts to escape, but is generally wounded too deeply to run far. The falcon clings with the utmost perseverance, nor ever leaves its prey till it falls; upon which the hunters from behind approaching, take up both, and reward the falcon with the blood of the spoil. They also teach the young ones, by applying them to the dead animal's throat, and accustoming them betimes to fix upon that particular part; for if it should happen that the falcon fixed upon any other part of the gazelle, either its back or its haunches, the animal would easily escape among the mountains, and the hunter would also lose his falcon.—They sometimes also hunt these animals with the ounce. This carnivorous and fierce creature being made tame and domestic, generally sits on horseback behind the hunter, and remains there with the utmost composure, until the gazelle is shown; it is then that it exerts all its arts and fierceness; it does not at once fly at its prey, but approaches slily, turning and winding about until it comes within the proper distance, when all at once it bounds upon the heedless animal, and instantly kills it, and sucks its blood. If, on the other hand, it misses its aim, it rests in its place, without attempting to pursue any farther, but seems ashamed of its own inability.

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[25] The author has here confounded together two animals very distinct in their formation and manners; the pigmy antelope, and the pigmy musk. The former is a native of the hottest parts of Africa, and, like all others of its tribe, is furnished with horns, and wants the canine teeth. It is in height about nine inches, and is said to be so active, as to be able to leap over a wall twelve feet high. Its general colour is a bright bay; the horns are straight, short, strong, pointed, and quite black; the legs are hardly thicker than a quill. The pigmy musk is a native of many parts of the East Indies. It has no horns, and in the upper jaw there is a pair of projecting tusks or canine teeth; and it has no appendicular or false hoofs. In size it is smaller than a domestic cat, and its general colour is a bright bay.—ED.

[26] "A mountain-antelope is a beautiful sight, and they who wish to learn the principles and the practice of mechanics in the school of nature, cannot, perhaps, have a finer study. The small footing of rock upon which the little elastic animal can stand is perfectly astonishing, such as we could hardly suppose to afford sufficient clutch for the gripe of an eagle, all powerful as that most majestic of birds anchors itself upon the pinnacle, and braves the utmost fury of the tempest. There is no clutching power in the hoofed feet of the mountain antelope, but the walls of their hoofs are sharp, and almost as hard as flint; their tendons as cords of steel, and their muscles are almost disembodied motion, such is their energy in proportion to their size. The four feet are brought close together on the point of the rock, as if they formed a disc like that on the under part of those fishes which adhere to the rocks by a pectoral sucker, and find their food in security, despite the turmoil of the rapidly racing waters. So does the mountain antelope poise itself on the pinnacle of the mountain crag, with an instinctive management of the centre of gravity; but yet a management so perfect, that the most prolonged and elaborate study of man cannot come up to it. When the animal wishes to spring, which it can do for many feet, and alight with safety on another craggy point, it bends the joints of its legs pretty equally; but as the projecting angle of the hind ones is backwards and that of the fore ones forewards, the bending prepares them for very different portions of the leap which the animal is to take. The extension of the fore legs, by bringing back the joints which answer to the wrists of man, tend to throw the body upwards, and the instant that this has freed the anterior hoofs from the rock, the whole animal in its hind legs and its back acts like a bended bow, and discharges itself from the tips of the hind hoofs with such velocity that if it were to impinge upon a lion it would fell him to the ground. Instinct teaches it to suit the exertion to the distance it has to go, of which the same instinct enables it to take measure by the eye; and by this means, when it arrives at the point on which it intends to alight, the momentum of the leap is exhausted, and it alights in safety and is again instantly balanced. Among the motions of animals, varied and curious as they are, there are not many equal to this, whether in energy, in rapidity, or in certainty. In fact, the whole mechanical process is performed as quick almost as thought; and although one is in the most favourabe situation for viewing it, all that can be seen is the transfer of the bounding animal from crag to crag."—*Mudie's Domesticated Animals.*

There is still another way of taking the gazelle, which seems not so certain nor so amusing as either of the former. A tame gazelle is bred up for this purpose, who is taught to join those of its kind, whenever it perceives them. When the hunter, therefore, perceives a herd of these together, he fixes a noose round the horns of the tame gazelle, in such a manner, that if the rest but touch it they are entangled; and thus prepared, he sends his gazelle among the rest. The tame animal no sooner approaches, but the males of the herd instantly sally forth to oppose him; and, in butting with their horns, are caught in the noose. In this, both struggling for some time, fall together to the ground; and, at last, the hunter coming up disengages the one, and kills the other. Upon the whole, however, these animals, whatever be the arts used to pursue them, are very difficult to be taken. As they are continually subject to alarms from carnivorous beasts, or from man, they keep chiefly in the most solitary and inaccessible places, and find their only protection from situations of the greatest danger

Note A.—*Different British breeds of Sheep.*

In the reign of Edward III. when wool was allowed to be exported, it brought £150,000 per annum, at £2 10s. a pack: which was a great sum in those days. At this time, when our woollen manufactory stands unrivalled by any nation in the world, and every method is taken to prevent this valuable commodity from being sent out of the kingdom, the annual value of wool shorn in England is supposed to be about five millions sterling; and when manufactured, conjointly with the Spanish wool imported, amounting to about £600,000, must be above £20,000,000.

The following remarks taken from Mr. Culley's 'Observations on Live Stock,' will be acceptable to many of our readers, as they convey a just idea of some of the most noted kinds of sheep at this time in the island. He begins with those of Lincolnshire, which are of a large size, big-boned, and afford a greater quantity of wool than any other kind, owing to the rich fat marshes on which they feed; but their flesh is coarse, leaner, and not so finely flavoured as that of smaller sheep. The same breed extends, with some variations, through most of the midland counties of England. The Dorsetshire breed is likewise remarkably prolific; the ewes being capable of bringing forth twice a-year. It is from these that the tables of our nobility and gentry are supplied with early lambs at Christmas, or sooner, if required. Great numbers of those early victims to luxury are yearly sent to the London markets, where they are sold at the enormous price of 10s. 6d. or perhaps 15s. per quarter. The manner of rearing the lambs is curious: they are imprisoned in little dark cabins; the ewes are fed with oil-cakes, hay, corn, turnips, cabbages, or any other food which the season of the year affords: these are given them in a field contiguous to the apartments where the lambs are kept; and, at proper intervals, the nurses are brought in to give suck to their young ones; while the attendants at the same time make their lodgings perfectly clean, and litter them with fresh straw. Great attention is paid to this, as much of the success of rearing these unseasonable productions depends upon warmth and cleanliness.

The Dorsetshire sheep are mostly white-faced; their legs are long and small; and great numbers of them have no wool upon their bellies, which gives them an uncouth appearance. They produce a small quantity of wool, but of a good quality; from which our fine Wiltshire cloths are made. The mutton of these sheep is very sweet and well-flavoured. The variations of this breed are spread through most of the southern counties; but the true kind is to be found only in Dorsetshire and Wiltshire. There is a breed not unlike this in Norfolk and Suffolk; but they are all grey-faced.

The Cheviot breed have a fine open countenance, lively prominent eyes, have no horns, and are mostly white-faced and white-legged; the body long, with fine, clean, small-boned legs; weight of the carcase from 12 to 18 pounds per quarter; and the mutton is highly esteemed for its flavour. The best breeds of these sheep are to be found in the north-west parts of the county of Northumberland, and on the range of hills adjoining them in Scotland, and are maintained (except when prevented by snow) solely from the natural produce of the grounds on which they depasture; which in general are very mountainous, and consist of ling, moss, heather, deer-hair, and wire-bent, with a mixture of greensward. We can find no account from whence this valuable breed originally sprung; which, as mountain sheep, are unrivalled, as well on account of their carcases and hardiness, as from the superior value of their wool, which is in the highest estimation for clothing, and sells from 2d. to 2½d. per pound higher than the best in the district. The great demand that has been made for this wool, added to the encouragement given by Sir John Sinclair, (who, for a few years, bought considerable numbers of these sheep, which he took to the Highlands of Scotland, and now breeds them upon the same kind of heathy mountains as the original stock were taken from;) caused an emulation among the breeders, which has been productive of considerable improvements in their stocks, both in the wool and the fore-quarter, in which they were generally deficient. But as improvements in stock can only be effected by slow gradations, and as this improved breed is but of a few years' standing, it will probably be advantageous, not only to individuals, but to the public at large, to encourage exertions which, if fortunately successful, might place these sheep upon a level with those produced upon well-cultivated grounds, which might be otherwise more advantageously employed for the use of the public. Thus the difficulty of producing an improved breed off a heath pasture has, in some measure, been removed, by the skill and attention of the Northumberland farmers, to whom we think the community much indebted; and we doubt not that in the course of a few years, this breed will become the parent-stock of all the sheep bred for grazing on heathy pastures, and what are called waste grounds. They thrive on the most sterile heaths, their wool is of the most desirable texture, they are easily fattened, and their whole conformation is so properly suited to mountainous pasture, that we are surprised the breed has not already been more generally diffused.

The South Down sheep are of the same hardy nature as the Cheviot breed, and like them can live and thrive on the barest heaths; their wool is also fine, and their mutton well-flavoured.

The north-west part of Yorkshire, with all that mountainous tract of country running towards Lancashire southward, and to Fort-William northward, is occupied by a hardy black-faced, wild-looking tribe, generally called *short sheep*, which differ from our other breeds, not only in the darkness of their complexions and horns, but principally in the coarse shaggy wool which they produce. Their eyes have a fiery, sharp, and wild cast. They run with great agility, and seem quite adapted to the heathy mountains they inhabit. Their flesh is peculiarly fine and high-flavoured. The three great fairs for these sheep (where amazing numbers of them are sold every year) are Stagshaw bank, in Northumberland; Brough, in Westmoreland; and Linton, in Scotland. There is likewise a breed of sheep inhabiting the same country as the former, but peculiarly distinguished from them by long, thin bodies, white legs, white faces, and by having no horns. Their wool is fine and thickly planted.

The largest sheep in Great Britain are to be met with on the banks of the Tees, which runs through a very rich and fertile country, dividing the counties of Durham and Yorkshire. The Tees-water sheep differ from the Lincolnshire in their wool not being so long and heavy; their legs are of a greater length and finer in the bone; the carcase is thicker, and considerably more firm; and they have fatter flesh, and the fibre very fine. This kind are very uncouth in their general appearance, and cut an awkward appearance beside the improved breed of the same district. The improved breed are, perhaps, the most perfect of the improved kinds of our island.

The sheep in the low parts of Northumberland are of a mixed breed, between the long kind, the Tees-water, and the Lincolnshire. The *mug*, or *muff* kind, was formerly common in that county. They were so called from their wool growing round their heads into their very eyes, so as almost to prevent them from seeing. This breed is now nearly exploded, being considered by every breeder of experience as unprofitable, from their thriving slowly, and being very tender.

In the northern districts of Scotland, and in many of the islands, there is a breed of sheep which differs from the others in the smallness of their size; many of them, when fed, weighing no more than six, seven, or eight pounds per quarter. They have dun faces without horns; and their wool, which is very fine, is variously mixed, and streaked with black, brown or red.

A wether of Mr. Culley's breed, fed at Fenton, in Northumberland, and killed at Alnwick, in October, 1787, when four years old, his dimensions were as follows:—Girth, 4 feet 8 inches; breadth over his shoulders, 1 foot 3 inches; over his middle, 1 foot 7¼ inches; across the breast from the inside of one fore leg to the inside of the other, 9 inches. At the dividing of the quarters through the ribs, it measured 7 inches of solid fat, cut straight without any slope; and his mutton was of the most beautiful bright colour. But in nothing was he so remarkable as in the smallness of his bones. The proprietor of this sheep laments that he had not the offals exactly weighed; (by offals we would be understood to mean, not only the tallow, but the head, pluck, and pelt, with the blood and entrails;) because it is now well known, that this breed of sheep have a greater quantity of mutton, in proportion to the offal, than any other kind we know of, and is consequently cheaper to the consumer.

The Dunky or Dwarf sheep, another variety of the sheep kind, deserves to be noticed for the singular and grotesque formation of its features. The wool growing round its head forms a kind of hood or ruff, before which stands its short erect ears; the uncommon protrusion of its under jaw considerably before the upper, by which the foreteeth are left exposed, and the shortness of the nose, which lies under its high projecting forehead. altogether give it the appearance of deformity, and make a striking contrast to most animals of the sheep kind. They are very small, and have no horns. In Lincolnshire, there is a small kind mentioned by Mr. Culley, under the name of Dunkies, which we suppose to be the same with this.

Before we quit this article, we must take notice of a breed of sheep which have hitherto been but little known or attended to, although it is probable they possess advantages of equal importance with those we have just mentioned; and, in all likelihood, they might have continued still longer in the same neglected state, but for the endeavours of a set of men, who, actuated by a truly patriotic zeal, are labouring to draw out the natural resources of their country, and secure, to the most distant and long neglected parts of this kingdom, those permanent advantages to which they are by their situation entitled. In pursuing these important objects, the Highland Society of Scotland have discovered that the Shetland Islands, and some parts of the Highlands of Scotland, are in possession of a breed of sheep which produces wool infinitely superior to that of any other in the kingdom, and equal to Spanish wool in fineness and texture. By order of the Society, specimens of these sheep have been obtained, for the purpose of a fair investigation into the nature and quality of their wool; which, upon examination, proves much finer than was at first imagined. The Shetland sheep are handsome, small, and, in general, hornless; and are peculiarly distinguished by the unusual shortness and smallness of their tails. They weigh, when fat, from 8 to 10 pounds per quarter. Their fleeces are, on an average, about two pounds weight. The wool, when properly dressed, is of a pure and glossy white: some small specimens of it, when compared with Vigognia wool was allowed, by good judges, to be fully as fine, and, in softness, equal to that of which the Indian shawls are made. The sheep producing this fine wool are said to be of the hardiest nature: they are never housed, and in the winter season are often so pinched for food, that they are obliged to feed upon the seaware driven on the shore. Besides the wool with which they are covered, they have long hairs growing amongst it, which serve to shelter it. It is a singular circumstance that the Shetland sheep are never shorn; but about the beginning of June, the wool is pulled off without the smallest pain or injury to the animal, leaving the long hairs already mentioned, which contribute to keep the creature warm and comfortable, at a season of the year when cold and piercing winds may be expected, in so northern a latitude. From the spirited measures which are now taking to preserve this valuable breed, we are led to hope, that British wool may in time regain that great superiority for which it was once so famous; and that by perseverance and attention to this important object, we may in time be enabled to produce not only as fine wool as can be obtained from any other country, but may also in the same breed be able to conjoin it with every other desirable peculiarity,—such as closeness of fleece, beauty and utility of form, hardiness, a capability of being easily fattened, largeness of size, and other valuable qualities adapted to every peculiarity of situation in these islands.

The disorders to which the South Down sheep are exposed, are, the gall, the red-water, and being paterish. The gall is a kind of purging which generally continues till they die, and is occasioned by feeding on land lately folded in wet weather, such as rape, turnips, &c. The red-water is a dropsy, and proceeds from the sheep being let out of the fold when the ground is covered with hoar-frost. A paterish sheep appears totally deprived of its senses, and is continually turning round instead of going forward. This disorder is occasioned by a bladder of water that surrounds the brain, for which there is no remedy. The rot is common to the South Down sheep, but is never caught upon the hills. It is caused by their being put out during the winter into the wealds, or by being turned into marshes to feed. Indeed it appears that the cause of every disorder is attributed to feeding the sheep on wet lands and in moist seasons, as they break out chiefly in the winter and spring months, which is an additional reason, being exposed to it in the wettest seasons of the year.—Hampshire and South Down sheep are equally subject to the scab, caused by their being overheated. In its effects it is similar to the itch; the remedy for which is,—weldvine root, tobacco, and brimstone, boiled in brine for the space of fifteen minutes, strained off, and kept for use; when it is poured upon the part affected, the wool being first separated. Or boil half a pound of tobacco in two gallons of brine, till it be half-wasted; then stir in a quarter of a drachm of sublimate, and the same quantity of precipitate; half an ounce of verdigris, powdered; two ounces of sulphur, and one ounce of alum. Another disorder these sheep are subject to, in common with other breeds, is the foot-rot; this last must be dressed with hot oils, (oil of vitriol and spirit of turpentine,) having first cut away the root of the disorder; or one ounce of sugar of lead, one ounce of Roman vitriol, one ounce of verdigris, half a pint of turpentine, all mixed together. Let the hoof be cut away to the bottom of the complaint; and having well shook the contents, apply the medicine.

Note B.—*Foreign varieties of Sheep.*

As Asia seems to exhibit the most numerous and finest varieties in the breeds of domestic goats, so Africa might claim the greatest number of distinct varieties of sheep, from those approaching nearest to their supposed primitive characters, to the ultimate degree of deterioration which can exist without extinction. The gradations in the scale of domestication, appear to be distinguishable in the first place, by a decrease of bulk in the horns, retaining the original direction, or passing into the elongated spiral turns; by a partial retention of hair on the body, more or less mixed with wool; by the local accumulation of fat on certain parts; by the expansion and drooping of the ears; the lengthening of the tail; by the arching of the nasal bones or chaffron; and last, by the wool changing from white to dark brown and black. In proportion as one or more of these characters combined are observed, the breed recedes from the original type; but in reviewing the races by these indications, regard must still be had to the obvious influences of climate and circumstances.

The principal breeds of Africa are the *Adimain* or *Long-legged* sheep, remarkable for elevated legs, and robust make, notwithstanding they have hollow flanks. In height at the shoulder, the ram measures three feet, and in length exceeds four feet six inches. The chaffron is more or less arched, the ears horizontal, the tail invariably very long, and the neck short. On the croup, back, and flanks, there is wool, varying in the degrees of fineness; but from the nape of the neck to the shoulders, a heavy mane of hair hangs down to the breast. The horns in general are short, forming a segment of a circle round the ears. Of this race there are several subordinate breeds; the first, or

Morocco breed, has long wool; the hair on the neck rather shorter and more undulating, of a rufous brown; the ears small, horizontal; the horns small, turning spirally outwards, and the scrotum forming two separate sacks; general colour white, with some marks of liver colour. A specimen sent by one of the princes of Morocco was in the possession of Sir J. Banks.

The *Emmema* or *Guinea breed* is the second, and well known by the figures of Marcgrave, Buffon, and M. F. Cuvier. The horns of this animal form a semicircle with the points forwards, rather robust and short. The females are hornless. There is usually some black distributed about the sides of the head and to the neck; and in proportion as this colour spreads in the specimens we have seen, the horns were observed to decrease in size, the ears to become more pendulous, and at last wattles were found near the throat. Of this sort was a large ram from Guinea, nearly without wool, white in colour, but with large black spots on the head, shoulders, flanks, and legs; on the neck there was a beautiful mane of long silky white hairs. It is this breed which was formerly introduced into Holland, and kept upon the islands near the Texel, and in Groningen, by means of which the cross-breed with long legs and long wool was reared, which bred twice a-year. It is also found with little variation in the Fezzan.

The *Congo* is a third breed of the above race, with similar proportions, but still hollower flanks, very arched chaffron, meagre and powerless, and instead of wool, covered with loose hair, slightly lengthened beneath the throat; the horns very short, turned back upon the neck; the ears pendulous, two wattles beneath the throat; the tail very long, slender, and almost naked. The females without horns; and the general colours of the fur consisting in large clouds of pale rufous-brown upon white.

The *Muana Conquo*, *Coquo*, and *Zomba*, Angola breeds, are better proportioned. The form of the chaffron is as in the breeds of Europe; the horns small; in the first and third turning from the head; in the Coquo forming a commencement of the usual curve. This species has also more and finer wool, and in general bears a black spot round the eyes; the others are more hairy; all have the tail very long, the ears only horizontal, and their general colour is white, with broad spots of rufous.

The *Zunu* or *Goitered* breed, is a fourth of the Angola race, low on the legs, with close hair, pendulous ears, and tail reaching to the fetlocks. It is very delicate, and has the singular peculiarity of a mass of fat rising in the form of a high collar be hind the horns, and resting upon the occiput; the horns are very short, slender, turned inwards towards the forehead; upon the larynx another mass of fat hangs like a goitre under the throat: the forehead is so prominent that a deep depression occurs between the eyes; the ears, neck, body, and superior part of the tail are pale brown; the head, goitre, throat, legs, belly, and inferior half of the tail, white.

At the Cape of Good Hope several breeds are found, the Dutch imported from Holland, the Indian from Ceylon, and the Indigenous or *Hottentot Broad-tailed* sheep. Besides these, other intermediate sorts have arisen by crossing between them; but the Broad-tailed, or Hottentot sheep, is the true South African, and now found also in Madras and Bengal. It is beneath the ordinary size. The males generally, the females always, without horns, handsomely made, the tail lower than the houghs, ending in a sharp point, the end of which is turned up, with a considerable expanse of fat beneath, rather thick, and not spread laterally; the wool is replaced by very soft and short white hair, with a fulvous spot round each eye; the same on the tips of the ears, the knees, fetlocks, and houghs. It is a very delicate breed, and almost useless if taken on board for sea-stock, wasting and perishing in the first gale of wind. This breed is one of a vast race, spreading, with various modifications, over Egypt, Barbary, the Levant, India, China, and Russia. Their name of Broad-tailed, common to the whole race, is derived from one or two masses of fat extending, with some variation of shape, on each side of the inferior part of the tail, where it is invariably naked and flesh-coloured. Mr. Pennant mentions a second breed of this race also from South Africa, with large pendulous ears, a convex face, small horns, and a long tail. There is a third which may be a cross with the Dutch. The chaffron is nearly straight, the ears small, horizontal; horns rather large, stretching at right angles from the head. It is a large variety; the head commonly black; the ears white, the wool on the forehead and body mostly white and coarse; the tail broad, with two lobes of fat at the sides, reaching to the houghs.

The *Barbary* and *Egyptian Broad-tailed* breed is more rufous on the neck, legs, tail, ears, and nose; the wool is coarse, the face not much arched, the ears pendulous, and the horns retain the original curve of the argalis on a smaller scale. In this breed the tail is long, and at base wider than the buttocks.

The last African race we shall notice, is found in Barbary, and even in Corsica. It is policerate, with pendulous ears; the tail not much widened, white in colour; posterior parts covered with wool; and from the head to the shoulders with loose soft hair. A crossed breed of this race with the Emmemas, and brought from Guinea, was in the possession of R. Wilding, Esq. It was entirely covered with soft silky hair, of a silvery whiteness; on the fore and hind part of the neck the hair was of great length, especially in front; half of the nose was jetty black; on each knee and on each thigh a black spot; the fetlocks and feet white. In the month of November it began to assume a soft woolly coat, like that of English sheep, so forcibly was it influenced by the climate. It was at first very gentle, attending its master in his walks, and leaping over the stiles in the path; but being introduced to other sheep, it became vicious, and was sent to a mountain enclosure, where it died.

The Asiatic sheep are partly of the same broad-tailed race as the African. Pallas mentions one with very few caudle vertebræ, but loaded on each side with a considerable and rounded mass of fat separated beneath, but uniting at the tail. It has coarse wool, is often dark-coloured, almost black; the hoofs are long, and the ears pendulous. This breed is found in China, Persia, and Southern Russia. The celebrated *Astracan* breed, which extends over Chorazan, about Meschet, and in the Kerman or ancient Caramania, is remarkable for the fine spirally curled wool of a gray or mixed black and white colour which is obtained from it. The sheep are below the ordinary size; the horns of the ram curved back and spiral at the tip; the ears pendulous; the colour dirty white, with a fine gray wool beneath; the tail not very broad. The fine furs are of the lambs slain with the dam a few days before yeaning. Some are black. There is another Russian breed without horns; the chaffron not much arched; having wattles under the throat; ears pointing downwards and forwards; a yellow face and a very short broad tail; the wool is white, and of good quality. The last broad-tailed breed of Northern and Middle Asia, is policerate, with the ears pointing forward and down, as in the former. The horns are four, five, and even six; the chaffron very convex; wattles under the throat, and very coarse wool. This breed forms the flocks of the Kirguise, and range along the banks of Volga and Jennissai.

The *Steatopyga* or *Fat-Rumped* sheep, are of another race, principally reared in Southern Tartary. They have small or no horns; the chaffron not quite straight, the mouth small and pointed; long pendulous ears, and the tail very short and without fat; some have wattles; the wool is of good quality, but mixed colours, being white and roan or light-brown in the rams, and black and white in the ewes. A variety of this, seemingly crossed with the Astracan, forms a breed in the *Mysore*. It is hornless, with narrow pendulous ears, a very short clean tail, and the wool, very fine, is particularly curled in small meshes, shaped like a cork-screw; the eyes are blue, and the colour pure white. It is the most beautiful breed of India. The late Sir Joshua Banks had a specimen which came from the gardens of Tippoo Sultan at Seringapatam.

India and China are, besides, in possession of a breed which seems allied to the African Adimain race. It is rather high on the legs with middle-sized curved horns, a collar of hair reaching to the shoulders, which, together with the head and legs, is deep rufous-brown. On the body there is a short, whitish, and coarse wool, rather curling, and the tail more hairy, reaches below the houghs, and is rufous.

The *Dolichura*, or Circassian breed, has a very long tail, trailing to the ground; middle-sized horns, twisting spirally from the side of the head, and very coarse wool, often black.

Among the European varieties.

The *Many-horned* of *Iceland* seems to be derived from the Russian policerate breed. They are small, with very irregular horns, three, four, or five in number, never spiral, but variously bent. They have a covering of long coarse hair, beneath which lies a coarse thick wool, and next to the skin a finer down. Their colour is rusty brown; the legs very small, and the hoofs narrow, long, and irregular, seem to acquire this form from their continual residence upon snow, which does not wear them down. Some of these sheep are housed in winter, but others are nearly wild, shifting for themselves, and often buried under the snow for many days. Yet a good ewe yields from two to six quarts of milk per day, from which butter and cheese are made. They are not shorn, the fleece coming off at once, when the young wool is somewhat advanced (about the month of May). There is, besides, in Iceland, a large white breed, with similar horns as the former, but probably obtained by crossing with some continental race.

In Corsica, the white policerate race, with coarse straight wool and small ears, seems derived from the Barbary breed.

A second race of Europe, with horns of a peculiar character, so as to have been regarded as forming a distinct species, and named Strepsicheros by the moderns, is the *Cretan*. The animals are of handsome form, with long horns, having a strong ridge in front; the ram is distinguished by having them usually in the form of a complete spiral circle at the base, then three additional spiral twists ascending vertically; the ears are small, drooping; the tail long; and the whole body covered with undulating wool, of rather a coarse quality; the face and legs are often speckled, or even entirely black. In the females the horns are divergent, straight, and twisted into four turns on their own axis. Their colour is white, and stature equal to the common sheep.

The *Wallachian* breed is derived from the Cretan, and resembles the old unimproved breed of England in form, shape of the ears, and voluminous scrotum, but the wool, though curling, is rather coarse, and straight on the thighs and tail; the horns are very long, marked with a prominent ridge, diverging almost at right angles from the head, and twisted in a lax spiral form, into two turns and a half. The breed is white.

But the most important continental race of Europe is the *Merino*. It is distinguished from British sheep, by bearing wool on the forehead and cheeks; the horns of the ram are ponderous, the spiral curve, as in the argali, turning forwards, and laterally into an additional crook; the head is large; the body rounded; the chaffron not much raised. There is a lax skin beneath the throat, which is in Spain esteemed a mark denoting a tendency to fine wool and a heavy fleece: the females are without horns. This race produces the wool of first quality for manufactures; it is abundant, very fine, soft to the touch, much packed, and twisted into the form of screws; oily, but shorter than in the common sheep. The race, subdivided into breeds, is extended over the greater part of Spain; large flocks are kept constantly travelling during the seasonable part of the year, and pent up during winter. The best breeds are those of Cavagne and Negrate; these are kept in pens during the cold season, about Merida, in Estremadura, on the left of the Guadiana, and from thence they move about the 15th of April, in flocks of two or three thousand, passing the Tagus at Almaras, proceeding towards Villa Costin, Alfaro, and Espinas, to be shorn; after which operation they travel again towards the kingdom of Leon, where they are divided into flocks of five hundred head, and distributed into the grazing territory of Cervera, near Aquilos del Campo. The Souan breed resides in winter on the borders of Estremadura, Andalusia, and New Castile. They remove at the end of April, cross the Tagus at Talavera de la Reyna, and at Puente del Arzobispo, direct their march towards Madrid, and from thence to Soria, where a part remains in the mountains, and the rest cross the Ebro to graze in Navarre and the Pyrenees. These three breeds are known by the epithet of Transhumante, or travelling, to distinguish them from the Estantes, or such as do not migrate. Of these latter, the best breeds reside about the flanks of the Guadaramo and Somosierra ranges, and in the environs of Segovia, where they are shorn in places named Esquileos; but the Leonese breed has the finest form, and produces the most abundant fleeces. The fleece of merinos weighs upon an average, from three to five pounds. In colour, the best are on the surface dark-brown, almost black, from the dust adhering to the greasy character of the pile; beneath, it is pure white, producing a striking contrast with the rosy hue of the skin; the harder the fleece, and the more it resists pressure, the more close and fine will be the wool.

The high mountains of Bhootan are frequented by an animal known by the name of Nervati, or wild sheep of Bhote, and is represented as similar in colour, and in the texture of the hair, to the chiru, that is, a slaty bluish-grey, inclining to red, and concealing, beneath the general superficies, a spare fleece of very soft wool, which lies close to their skin. This colour is, probably, not unlike that of the musmon, or a liver-coloured gray; but it may be that the nervati is of a different species, and even of a different genus, because we have no account of the horns.

The *Asiatic Argali*. (*Ovis Ammon.*) This species, observed and described by Gmelin and Pallas, is perhaps the pygargus and ophion of the ancients. Several of its Asiatic names have a reference to the white rump.

The male is not much inferior in size to a stag, individuals having been killed that weighed considerably above two hundred pounds. He is about three feet high at the shoulders, and nearly five feet in length. The horns are very large, sometimes near four feet long, and weighing upwards of thirty pounds; their width is so considerable at the base, that young foxes are said to shelter themselves in such as are found casually on the ground; they rise near the eyes before the ears, occupying the greater part of the back of the head, and nearly touching above the forehead, bending at first backwards and downwards, then to the front, and the points finally outwards and upwards; their base is triangular, with the broadest side towards the forehead; the surface is wrinkled crossways to beyond their middle, but the extremity is more smooth. Some variation of form occurs in the argalis of Caucasus, their horns being often only semicircular, almost round at the base, extremely heavy and stout, dark brown, with scarce any wrinkles, not tapering, but ending in a stumpy form. The fur of the animal consists of short hair, fulvous-gray in winter, with a ferruginous buff-coloured streak along the back, and a large disk of whitish buff on the buttocks, including the tail; the internal side of the limbs and the belly are still paler, and the chaffron, nose, and throat are white. In summer the whole fur is more rufous, but the buff-coloured mark on the buttocks remains unaltered. The female is smaller, with slender horns, nearly straight, and small wrinkles resembling those of a domestic goat; the colours of the hair are nearly the same, but paler, and without the disk on the buttocks; both have the face rather straight, the tail very short, the eye-lashes whitish, the skin beneath the throat lax, and covered with longer hair, and a close wool concealed by the outer coat.

The argali inhabits the highest mountains of central Asia, the Caucasus, Kamschatka, and the elevated steppes and plains of Siberia, &c. The males fight fiercely in the manner of the common ram; they breed twice in the year, in spring and autumn, and produce one or two lambs at a birth. These are at first covered with a gray fur, and if taken young they are easily domesticated; but the adults remain always intractable. They are strong and active, flying from the least danger, always in a direction of the most inaccessible ground, but their motion is from side to side, like that of the domestic sheep, and stopping in their course to look at the pursuer. The flesh is esteemed very savoury, and the skins, now becoming more rare in Russia, fetch a good price on the spot, to be converted into articles of clothing. In the autumn, when they descend from the mountains, they are very fat; but in the spring they are lean, from want of choice food, and from licking salt, before they again ascend to the sunny glens of the high mountains.

The *American Argali*. (*O. Pygargus.*) This animal was known in the time of Hernandez, by the name of sheep of California; Venegas and Clavighero, afterwards noticed it, and the Canadian fur traders have long been acquainted with it by the name of Culblane; but Mr. M'Gillivray, after his travels in the Rocky mountains in 1800, first drew the attention of zoologists more particularly to the species and its spoils have since been transmitted to Philadelphia and London. In size and form, it resembles the former, being also about three feet high at the shoulder, and four feet six inches in length, but the horns are still larger and more perfectly spiral, measuring above fifteen inches each at their base, and the pair covering the sides of the head from near the eyes to the occiput, touching at the top of the forehead. This structure lengthens the head, raising the forehead high between them, and depressing its articulation below the orbits: their triangular character is almost effaced by the arching or the sides. In old specimens the wrinkles are not very prominent, and the tips are commonly broken off. The face and mouth is white; the cheeks, neck, back, and limbs, dun rufous-gray; the tail, about five inches long, together with the buttocks and part of the croup, is enclosed in a disk of whitish buff; the eyes are pale bluish-gray, and there is no appearance of a lax skin or longer hair beneath the throat. The females are smaller, and have similar horns to those of Asia.

In their manners they resemble the *O. Ammon*, living in troops of thirty to forty, headed by an old ram, bounding vigorously along the steepest ridges, and occasionally descending on the plain, particularly during the severest winter days. If the American species be the same as the Asiatic, which appears very probable, it can have reached the New World only over the ice by Behring's Straits; and the passage may be conjectured as comparatively of a recent date, since the argali has not spread eastward beyond the Rocky mountains, nor to the south, farther than California.

The ***Bearded Argali.*** (*O. Tragelaphus.*) Africa has its argali, and in all likelihood more than one variety of the species; for it does not appear that the specimen described by Dr. Caius, and that discovered by M. Geoffroy St. Hilaire in the mountains of Egypt, can be viewed otherwise than as varieties of the same species; that figured by Mr. Pennant may be altogether distinct.

The tragelaphus, described by Caius about 1561, brought from the mountains of Mauritania, Morocco, was larger than a fallow-deer, or nearly equal to a stag, being three feet six inches at the shoulder, and four feet six from the nape of the neck to the tail. The head, from the nostrils to the vertex, one foot three inches; the horns one foot one inch and a half in circumference at base, one inch asunder on the head, bending back and downwards, angular, black, two feet one inch long, and wrinkled; the ears small; a beard formed by hairs on the cheeks, and under-jaw dividing into two lobes; the neck thick, of no great length, and beneath it a quantity of long hairs hanging from the throat to the knees; a setaceous mane stood up along the neck, and in particular about the withers, where it was tufted, long, and erect, and of the same colour, or somewhat darker than that of the rest of the body, which resembles the winter dress of a stag, or blackish-rufous; the knees, protected by long and dense hairs which seem intended to protect them in bounding, were bent backwards, but without a callosity; the legs were slender, and the external hoofs of the fore-feet longer than the internal; the incisors were only *six* in number; the nostrils black, divided by a perpendicular line of the same colour. It was gentle, petulant, and lascivious, fond of ascending high places and roofs of houses; it could run swiftly and bound prodigiously. According to Caius the females are larger than the males, but are not provided with a similar luxuriant mane, but on this head he does not seem to speak from personal observation.

The ***Musmon.*** (*O. Musmon.*) The ancients were acquainted with this animal: Pliny notices the musmon, musimon and ophion. In Candia it is still said to be found. The mountaineers of Sardinia and Corsica are well acquainted with it, by the name of Mufro, and in former ages it abounded in Spain, and, probably, in all the high primitive chains of mountains in temperate Europe. If one species of ovis can make a direct claim to the progenitorship of the domestic breeds more than another, it would be the musmon and the last described variety of Africa, which by the structure of its horns is more allied to musmon than to ammon; both having proved that the intermixture with domestic sheep is readily accomplished, and the intermediate breed prolific. It is probable that African sheep first peopled the south and west of Europe, perhaps as early as the Asiatic, which may have spread themselves over Greece, Sicily, and the east of Italy; but a later period may be assigned to those which came round the Black Sea into the valley of the Danube: the northern nations of wooded Europe could not maintain them till a period comparatively recent.

The Corsican musmon, like the African animal, has the horns shorter than the other argalis, usually not exceeding one and a half the length of the head, curved backwards, and the points turned inwards. In general the colour of the fur is a brownish or liver-coloured gray, with more or less white upon the face and legs; there is also a tuft of long hair beneath the throat, and a darker streak along the back and on the flanks. But they sometimes vary in colour, being marked with large black spaces, particularly about the neck, resembling, in this particular, the domestic breeds both in Africa and India, which appear to be nearest the original stock. The females are in general without horns, and of all the wild species of the sheep they have the chaffron most arched, and are said to be the least intelligent and hardy. Of the facility of breeding this species with our domestic sheep, proof was obtained from the specimen brought to England by the celebrated Pascal Paoli, which was the parent of a mixed progeny here; hence, there is some ground to suspect that the musmon and ophion of the ancients were not synonymous names for the same animal, and that the wild sheep of Spain and the Carpathian mountains are not the mufro of Corsica. The Spanish wild sheep mixed however with the domestic, and the intermediate breed, according to Pliny, were named umbri.

The musmons of Sardinia and Corsica never quit the highest ridges: where, however, the temperature allows no permanent snows. They live in small herds, headed by an old male, uniting occasionally into flocks of near one hundred; but they separate again in December and January, when the rutting season commences, and the usual battles have decided how many females each male can retain. The females yean two lambs in April and May, which run about the moment they are dropped, and are cherished and defended with great constancy by their dams: they are not adult till the third year, but the power of procreation is the same as in the domestic races, and can commence at eighteen months. In Corsica the male is denominated mufro, and the female mufra, from which Buffon has formed the word moufflon. Their skins are used for various purposes, and in that island and Sardinia, the mountaineers still convert them into vests, and a kind of cloaks, which may be the present representatives of the *Mastruca Sardorum*, noticed in the commentaries on Cicero, as made from the skin of the mufro: this dress was worn in particular by the inland robbers.

It appears that in ancient times a wild species of sheep inhabited Great Britain. Boetius mentions a wild breed in St. Kilda, larger than the biggest goat, with tails hanging to the ground, and horns longer and as bulky as those of an ox. Mr. Pennant observes upon this subject, that such an animal is figured on a bas relief taken out of the wall of

Antoninus near Glasgow.—*See Major Smith's Supplement to Cuvier's 'Animal Kingdom.'*

Note C.—*The Ibex.*

The *ibex* is an animal near five feet long, two feet eight inches in height at the shoulder, with about two inches more at the rump; the horns are flat, sustained by two longitudinal ridges at the sides, traversed by numerous cross ridges or knots, disposed at intervals so as to bear a resemblance, when seen in front, to a segment of a cog-wheel; they are nearly vertical to the plane of the face at their roots, diverging and uniformly falcated backwards, sometimes thirty inches long, dark-coloured and very robust. It is asserted that the transverse knots mark their age. In the first years the ibex is of a light ashy-gray colour, deepening to brown as it advances in age, and in the adult varies from a red-brown in summer, to a gray-brown in winter; the hair is never very long or loose; on the face, and along the back, is a line of a dark colour; the internal face of the thighs and buttocks are whitish; the inside of the ears and inferior part of the tail is white; the head under the chin is short, dark-brown, and not very full. An adult female, which was shot in the mountains of Asturias, in Spain, had horns much resembling those of the male in his third year, but more slender, less curved, and marked with four knots on the anterior side; the forehead, sternum, anterior face of the legs, and the pasterns, were earthy brown; the neck and back gray-brown, paler beneath. The ibex ruts in autumn; the male then emitting a most powerful smell, assembles the females, and remains with them till the spring; when the females begin to withdraw into cover, for the purposes of parturition, which takes place in one hundred and sixty days after impregnation, usually in April; the kids following the mother in a few hours after their birth.

The species seems to be confined to the highest mountains of Europe, the Alps, particularly the Rhœtian, and the Pyrenees, with their loftiest branches. They may exist still in those of Candia, Greece, and the Carpathian, but it is doubtful whether the variety noticed by Pallas in the Caucasian range was decidedly of the same species. They prefer the most elevated ridges, upon and near the verge of perpetual snow, which they invariably seek when pursued. In Savoy and Switzerland they are now rarer than in the Tyrol, and in the Pyrenees they are nearly extinct.

The Abyssinian ibex is somewhat more elevated on the legs than the European, of a dirty brownish fawn colour, with a short beard, and lengthened hair under the throat down to the breast, and a darkish line on the anterior part of the legs, and along the back; the ears appear shorter, but the horns, of a dirty colour, are superior in length to those of the ibex, forming a half circle, closer on the forehead, less diverging backwards; they are subtriangular, having a round edge to the front, marked in one pair with twenty-three very elevated cross ridges, extending to near the posterior edge, and rather irregular in their distances; besides these, four other less prominent appear near the base, and from the thirteenth the larger knots are separated by three smaller. This species, we are told, is numerous in the mountains of Abyssinia and of Upper Egypt.

M. F. Cuvier distinguishes the Caucasian ibex from Ægagrus "by the horns being triangular, the anterior face forming an angle, with ribs or projecting knots." This definition would apply to the Abyssinian; it is therefore necessary to add, that the knots are progressively more distant from each other as they recede from the base, with uniform transverse wrinkles, not so prominent, confused, and crowded, as in the former. M. Guldenstadt first described the species, which he discovered in the northern part of the Caucasian mountains. In size and proportions it resembles the ibex of Europe, but is broader and shorter in the body; dark brown on the superior parts, and white on the inferior; the head is gray, excepting a space round the mouth, which is black; the breast, and a line along the back, are dark, and there is a white streak at the back of the shanks; the under-jaw and gullet are generally whitish-gray, and the anterior part of the legs is dark; the horns are about twenty-eight inches long, dark brown, and very solid. The hair of this species is rather hard, more ashy in winter, and at the root interspersed with much grayish under-wool. The females are smaller, with diminished horns, as in the former. This species of ibex is equal, if not superior, in strength and agility, to the Alpine, making immense bounds with the utmost confidence. Monardes relates that he saw an ibex leap from the top of a tower, and falling on its horns, immediately spring up and move on without having received the slight injury. It resides in the Caucasian mountains about the sources of the Terek and Cuban, and is probably found in the high mountains of eastern Persia.

The Ægagrus is distinguished from the former by the horns forming an acute angle to the front, with the ribs less broad, assuming an undulating edge, and the posterior part rounded. In size and proportion it is nearly the same as the ibex; the fur is grayish-brown above, with a dark line on the back, and a black tail; the head black about the nose, rufous at the sides; beard and throat brown; the horns are near three feet long, but in the females they are small, or altogether wanting: their fur is paler and more uniform in colour. Kæmpfer noticed the bezoar-bearing goat by the name of *paseng*, which Buffon by mistake transferred to an oryx; and it is very probable that the antelopes, as well as other ruminants, occasionally produce the concretions. That the oriental bezoar was extracted chiefly from the viscera of the present species at a very early period, appears indicated in a bas relief at Chelminar or Persepolis, which represents a man leading a wild goat by the horns in token of tribute to the great king. Kæmpfer, Gmelin, and others, notice the Ægagrus as found in the Caucasian mountains, the hills of Laar and Chorazan in Persia, and in still greater abundance in Asia Minor. Pallas first clearly distinguished it from its congeners, and conjectured that the domestic goats might derive from this stock.

Note D.—*Of the genus Antelope.*

The following is a scientific description of the characteristics of the genus Antelope.—Their horns consist of a solid bony core, with a true horn vaginating upon it. These are present or absent in the females and in the males, sometimes to the number of four. The core or osseous nucleus is solid, destitute of sinus or pores within the base; it stands generally almost above and between the arches of the orbits. The horn itself turns into various curves or directions, often without consimilarity in the kindred species of the groups. The ears are usually long, moveable, and furnished on their internal surface with three striæ of whitish hairs upon the naked darker ground of the skin. The eyes, likewise, in the greater number, are large, prominent, dark, and soft, and beneath them, in the direction of the nose, a sack is found in most species, more or less developed, opening externally by a slit, as in certain deer, and in some appearing to communicate with the nostrils and the olfactory apparatus; while in others again, a puncture only is seen, and a second sack descending near to the corners of the mouth, likewise communicates externally by a slit or a puncture: the former of these seems to afford increased facilities in breathing, and greater powers of scent; but the use of the latter is as yet unascertained in the animal economy. The nostrils are usually shaped as in sheep, or without a naked and moist muzzle; some however have this form half developed, or a half muzzle, and others again have one as complete as in the stag, but never to the extent which is seen in the ox or buffalo. They are provided with a gall-bladder. The mammæ of the females are always inguinal; in number either two or four, and these are often observable in a rudimental state on the abdomen of the males. Besides these, in the hollow part of the groin, small naked folds of the skin or inguinal pores are found, one on each side of many of the middle-sized and small species. Within them an unctuous and odorous secretion takes place, similar to that which is found in the suborbital sinus, but the use or utility is not as yet ascertained, though some inference might be drawn from a habit common to the species provided with them, of rubbing and pressing both these parts against hard substances, and then seemingly deriving great pleasure in smelling at the substance extruded. The tails of these animals are round, either short, or descending to near the hough; the legs of nearly the whole are slender, firm, and elegant, often furnished with brushes or tufts of hair on or below the knees, and the greater number have the anterior quarters somewhat lower than the croup. In general their attitude is more gathered; that is, they stand with the feet more under them than deer, and hence their bounds are greater, and their speed in general surpasses that of every other mammiferous animal. The hide is either white or black, but these colours seem to be constantly connected with locality: the black being, perhaps, invariably independent of the colour of the hair, an indication that the animal is a resident of the open burning plains and deserts of the tropics; and the white, one who resides in more temperate regions, or lives under the shadow of the forest.

The groups with spiral and lyrated horns are mostly gregarious, frequenting the open plains, and often preferring the most barren tracts; the larger species, however, more usually live in families or small troops, on the desert or in mountainous woods, and the smallest are not unfrequently solitary or monogamous, residing in the thickets, the forest, or the borders of rivers; while there are others whose habitat is confined to mountainous regions, inaccessible crags, and even to the elevated zones on the confines of perpetual snow. These walk with perfect composure along the giddy brinks of the most awful precipices, climb and descend with wonderful care and precision, and leap down or up to the smallest surface that will contain their collected feet with perfect firmness; but the speed of those who frequent the plains, and more particularly of the swiftest species, consists in the alternate action of three or four strokes of a gallop, terminated by a long bound, repeated in constant succession and producing a beautiful effect: of others it is a uniform stretch termed running. Though vigilant and timid by nature, the gregarious species have the same curiosity which deer and sheep evince at the sight of strange objects; flying with prodigious speed, then stopping and turning to gaze. Their voice is mostly weak, and seldom heard: it consists in some in a feeble bleating, in others it is a groaning or whistling sound, and there is one which barks so as to deceive the unwary traveller into a belief that he is near the abode of man, when in fact it is the proof of his being benighted in the deepest recesses of the wood.

In a wild state it seems that each species feeds on a few favourite plants; they pick rather than browse: some, like several species of deer, nibble the leaves of trees, acacias, mimosas, and shrubs. The gregarious keeping on the open plains, select grasses and their roots, heaths, wild tritica, and are not averse to bitter succulents and intoxicating plants, being even attracted by the smoke of tobacco. There is a disposition in several species to dung in one place, which arises probably from the extreme delicacy of their sense of smelling. In general their venison is lean, and savours of a musky smell; but the flesh of others is praised, and all afford the usual meal to the larger nocturnal carnivora, and even to the eagle. The females, particularly of the gregarious species, are gentle and confident when reduced to domesticity, but the males, at least in the rutting season, are vicious and subject to sudden capricious fits. The beauty of their soft and large dark eyes has long been the theme of Arabian and Persian poetical enthusiasm. The very name gazelle, by which several of the genus are designated, is also in Arabic an image of peculiarly tender and delicate women; it is likewise applied to a species of stanza of highly polished and tender versification: the root, however, seems taken from the Hindu Sasi or Sasin, the name of the common antelope. It appears that in the beautiful regions of the East, beyond the river Indus, these animals have attracted the notice of mankind in an extraordinary degree, even in the primitive ages of that land of early civilization; for we find them in the oldest mythologies, and among the symbols of its astronomy. The fleetness of the antelope was proverbial even in the earliest times: the speed of Asahel (2 Samuel ii. 18.) is beautifully compared to that of the zebi, and the Gadites were said to be as swift as the antelopes upon the mountains. The sacred writers took their similes from such objects as were before the eyes of the people to whom they addressed themselves. There is another instance drawn from the same subject: the disciple raised to life at Joppa was supposed to have been called Tabitha, i. e. Dorcas, or the antelope, from the beauty of her eyes. And to this day one of the highest compliments that can be paid to female beauty in the eastern regions is, *Aine el lezozel*, "You have the eyes of an antelope."

Of the very numerous species of the genus antelope, it would be almost impossible to give a complete and distinct description. The more remarkable of them are noticed by Goldsmith under the head of gazelles: we may here notice a few other antelopes not mentioned by our author. The *springbok* is well known to the colonists at the Cape. "It is easily distinguished," says Burchell, "from all the known species, by the very long white hair along the middle of the back, which lying flat, is nearly concealed by the fur on each side, and is expanded only when it takes those extraordinary leaps which first suggested its name." Mr. Burchell's description of a herd of springboks is very picturesque:—"At this high level we entered upon a very extensive, open plain, abounding to an incredible degree in wild animals; among which were several large herds of quakkas, and many *wilde beests* or *gnues*: but the *springbucks* were far the most numerous, and, like flocks of sheep, completely covered several parts of the plain. Their uncertain movements rendered it impossible to estimate their number, but, I believe, if I were to guess it at two thousand, I should still be within the truth. This is one of the most beautiful of the antelopes of Southern Africa; and it is certainly one of the most numerous. The plain afforded no other object to fix the attention; and even if it had presented many, I should not readily have ceased admiring these elegant animals, or have been diverted from watching their manners. It was only occasionally that they took those remarkable leaps, which have been the origin of the name; but when grazing, or moving at leisure, they walked or trotted like other antelopes, or as the common deer. When pursued, or hastening their pace, they frequently took an extraordinary bound, rising with curved or elevated backs high into the air, generally to the height of eight feet, and appearing as if about to take flight. Some of the herds moved by us almost within musket-shot; and I observed that in crossing the beaten road, the greater number cleared it by one of those flying leaps. As the road was quite smooth and level with the plain, there was no necessity for their leaping over it; but it seemed that the fear of a snare, or a natural disposition to regard man as an enemy, induced them to mistrust even the ground which he had trodden." The migrations of innumerable companies of springboks, from unknown regions in the interior of Africa, to the abodes of civilization, are amongst the most extraordinary examples of the fecundity of animal life. The vast quantity of a species of birds of South America, which produce the *guano* (a manure) in sufficient abundance to be a great article of commerce—the flocks of pigeons of North America—the locusts of Africa—are not more striking than the herds of springboks. They do not come alone to the cultivated plains. The lion has been seen to migrate, and walk in the midst of the compressed phalanx, with only as much room between him and his victims as the fears of those immediately around could procure by pressing outwards.

The *elk antelope* is also an inhabitant of the Cape, as well as the greatest part of India, and is one of the larger kinds of antelopes. It has straight horns, two feet in length, of a dark brown colour, marked with two prominent, spiral ribs, running near two-thirds of their length, but smooth towards the ends, which are turned a little inwards; the forehead is flat and broad at the top, and has a forelock, standing erect, the whole length of it; its nose is sharp, and its breast is covered with a loose skin. This animal is of an ash colour, inclining a little towards blue; has a thin, upright mane, quite black, which extends from the nape of its neck along the top of the back; it has a tuft of black hairs at the end of the tail. The elk antelopes live in plains and valleys, and when hunted always run, if possible, against the wind; they are not very swift, and being in general fat, especially the males, which are always the largest and fattest in the herd, are soon tired. The hunter generally endeavours to get to windward of the animal, which when he has accomplished, he takes an opportunity of throwing himself from his horse, and instantly shoots the flying game. At this practice the Dutch colonists at the Cape are so expert as seldom to fail. Sparrman says, there have been many instances where keen sportsmen, as well for their own pleasure as convenience, have hunted elk antelopes for many miles together, from open plains, and driven them to their own doors, before they thought it worth while to shoot them. The female has horns like the male, but smaller, which the Hottentots use for tobacco-pipes.

The *wood antelope* is found in the country about the Cape, and lives chiefly in woods and groves, from whence it derives its name. Its horns are black, somewhat more than ten inches long, and have three sides wreathed in a spiral direction towards the top; at the bottom they are rough, in consequence of a number of wavy rings, which, however, are not elevated much above the surface; at the top, they are round and sharp-pointed, and in that part as smooth as if they had been polished; their position is almost in the same line with the forehead, inclining a little forwards, and by means of the twist they make recede from each other towards the middle, where they are three inches distant; at the base, they are only one inch. The wood antelope is somewhat more than two feet and a half high, of a dark brown colour, and in some parts bordering upon black; on each cheek-bone there are two large round white spots; another still larger occupies the fore part of the neck, somewhat below the top of the windpipe; and several smaller white spots are scattered over the haunches; a narrow line of white hair extends from the neck all along the back and tail, but is not easily distinguished, being hid by the length of the dark brown hairs at the top of the back, which are three or four inches long, so as to form a kind of mane; the hair on the head is very short and fine; in other parts of the body it is longer, resembling that of the goat's; its tail is not more than a finger's breadth in length, covered with long hairs, which extend down the hind part of the thighs and buttocks; the legs and feet are slender; the fetlock and joints are likewise small; the nose and under lip, which are white, are decorated with black whiskers about an inch long. As this animal runs but slowly, it is sometimes caught with dogs. When it finds there is no other resource, it boldly puts itself in a posture of defence; and when going to butt, kneels down, and in that position sells its life at a very dear rate, killing and goring some of the best and most spirited hounds. It carries its head straightforward while it runs, laying its horns upon its neck, to prevent their being entangled in the bushes. The female is without horns; and being lighter than the male, runs more freely through the forests, and is not so easily caught. Her breast is said to be very plump: the flesh is good, but not very tender.

The *Cervine antelope* is one of the most common of all the antelopes, being well known through all Africa. Sparrman gives a very accurate description of this animal. Its height is somewhat more than four feet; the horns are from ten to twenty inches long, very strong and black, almost close at the base, diverging upward, and at the top bending backwards in a horizontal direction almost to the tips, which turn a little downwards; they are embossed with about 18 rings of an irregular form. The general colour of the Cervine antelope is that of cinnamon; the front of the head is marked with black, as is likewise the fore part of the legs; the hind part of the haunch is covered with a wide black streak, which reaches down to the knee; a narrow stripe of black begins behind each ear, and runs all along the ridge of the neck; a dark brown oval spot extends over the back, terminating just above the tail, which is slender, somewhat like that of an ass, and is covered with strong black hairs about six inches long; there is a pore about an inch below the eye, from which a matter is distilled, somewhat like ear-wax, which the Hottentots preserve as a rare and excellent medicine. This animal is supposed to be the *bubalus* of the ancients. The hair of the Cervine antelope is very fine; and its long ears are covered with white hair on the inside. It has no teeth in the upper jaw, and only eight teeth in the lower. The legs are rather slender, with small fetlocks and hoofs. The Cervine antelope is one of the most unhandsome of all the antelope tribe, from its large and high fore head, with its tail and ears so nearly resembling those of an ass. Its pace when at speed is approaching to a heavy gallop; but notwithstanding this awkward motion, its speed is equal to any of the larger antelopes. When it has got a-head of its pursuers, it is very apt to turn round, and stare them full in the face, and then resume its flight: thus it will continue to do for several times during the chase. Its flesh is of an agreeable high flavour, but rather dry.

The *Scythian antelope* somewhat resembles in form the domestic goat; its horns are distant, lyre-shaped, and almost diaphanous; its nose is cartilaginous, and arch; its nostrils are open, with the bony bridge; six grinders on each side; its limbs and neck are very slender; its fur in the summer is short and smooth; on the back and sides of a tawnyish gray; darker below the knees; neck and body beneath, and limbs within-side, white and gradually whitening beneath the eyes; its fur in winter is long and coarse. Its tail is four inches long, naked below, and tufted at the tip. It inhabits Russia and Poland, as far as the Altaic Alps, in open deserts abounding in salt-springs: it is a timid and swift animal; gregarious in autumn, and migrates into southern deserts; it bleats like a sheep, and is very quick of smell; when feeding or sleeping it is always guarded by a sentinel; it always walks backwards when grazing; it runs with its head very erect; the female is hornless, and usually brings forth one young one at a time; it is very much infested by the gadfly; its odour is somewhat balsamic; sometimes it has three horns, and but rarely one. Its flesh is hardly eatable; generally about four feet high.

The *gnu* may be added to the tribe of antelopes. Gnu is the Hottentot name for a singular animal, which, with respect to its form, is somewhat between the horse and the ox. It is about the size of the common galloway, its length being somewhat above five feet, and its height rather more than four. This animal is of a dark brown colour; the tail and mane of a light gray; the shag on the chin and breast, and the stiff hairs which stand erect on the forehead and upper part of the face, are black; the curvature of the horns is very singular, being bent forewards at the base, and backwards in the middle; its neck is maned; and its tail, which is like that of a horse, is of a dirty white colour. It inhabits the plains of Africa behind the Cape of Good Hope; it feeds in large troops, is a very fierce animal, and fights with its horns. Mr. Pringle gives the following account of this animal, as seen by him in its native regions. "The curious animal called *gnu* by the Hottentots, and *wilde beest* (*i. e.* wild ox) by the Dutch colonists, was an inhabitant of the mountains adjoining the Scottish settlement at Bavian's river, and I had therefore opportunities of very frequently seeing it both singly and in small herds. Though usually, and perhaps correctly, by naturalists ranked among the antelope race, it appears to form evidently one of those intermediate links which connect, as it were, the various tribes of animals in a harmonious system in the beautiful arrangement of nature. As the *hyæna* dog, or '*wilde hond*,' of South Africa, connects the dog and wolf tribe with that of the hyæna, in like manner does the gnu form a graceful link between the buffalo and the antelope. Possessing the distinct features which, according to naturalists, are peculiar to the latter tribe, the gnu exhibits at the same time, in his general aspect, figures, motions, and even the texture and taste of his flesh, qualities which partake very strongly of the bovine character. Among other peculiarities I observed that, like the buffalo or the ox, he is strangely affected by the sight of scarlet: and it was one of our amusements when approaching these animals to hoist a red handkerchief on a pole, and to observe them caper about, lashing their flanks with their long tails, and tearing up the ground with their hoofs, as if they were violently excited, and ready to rush down upon us; and then, all at once, when we are about to fire upon them, to see them bound away, and again go prancing round us at a safer distance. When wounded, they are reported to be sometimes rather dangerous to the huntsman; but though we shot several at different times, I never witnessed any instance of this. On one occasion a young one, apparently only a week or two old, whose mother had been shot, followed the huntsman home, and I attempted to rear it on cow's milk. In a few days it appeared quite as tame as a common calf, and seemed to be thriving; but afterwards, from some unknown cause, it sickened and died. I heard, however, of more than one instance in that part of the colony, where the gnu, thus caught young, had been reared with the domestic cattle, and had become so tame as to go regularly out to pasture with the herds, without exhibiting any inclination to resume its natural freedom; but in consequence of a tendency which the farmers say they evinced to catch, and to communicate to the cattle, a dangerous infection, the practice of rearing them as curiosities has been abandoned. I know not if this imputation be correct, but it is true that infectious disorders do occasionally prevail to a most destructive extent among the wild as well as the domesticated animals in South Africa, and especially among the tribes of larger antelopes. There is another species of gnu found farther to the northward, of which I saw a single specimen in the colony, which in the shape of the horns, and some other particulars, still more resembles the ox. This species has been described by Burchell under the name of *antelope taurina*."

Mr. Pringle gives the following description of *the Hartebeest* (*Antelope bubalis*), which also came under his observation. "The hartebeest is one of the largest and handsomest of the antelope family. It is nearly of the same height as the gnu, but of a more slender and elegant shape. It was pretty numerous on the mountains around our settlement, and not unfrequently furnished us with game. It had many other enemies, I observed, and some of them only less formidable than man, the great destroyer. In the nooks of the narrow ravines, through which the wild game are wont to descend from the steep and stony mountains, for change of pasturage, or to drink at the fountains that ooze from their declivities, I have frequently found fresh skulls and horns of the hartebeest—those slight relics being all that remained to indicate that there the lion had surprised and rent his prey, and that the voracious hyæna had followed and feasted on the fragments, devouring even the bones, except the skull and a few other unmanageable portions. Though the common hyæna is no match in speed for the fleet full-grown hartebeest, he probably picks up many of the young ones, and is always sure at least of the aged or infirm. The hyæna dog is probably still more destructive. Too slender to attack such an animal as the hartebeest individually, these 'dogs of the desert' associate themselves in packs, to hunt down this and other large antelopes. I once witnessed a chase of this kind, in which a noble hartebeest, hard-pressed by a troop of these 'wildehonden' (as the boors call them), dashed across our garden and orchard ground, and onwards among our huts, at noonday. The wild dogs, on hearing the halloo that was raised by some of the people who witnessed this scene, stayed their quest for a brief space, as if alarmed; but before we could get a gun or two to attack them, they vigorously renewed the chase down the valley, making a small circuit to avoid the houses; and, as the poor antelope seemed sore spent, I have no doubt that he would be speedily run down, notwithstanding the slight advantage he gained by our interference."

CHAP. IV.

OF THE MUSK ANIMAL.

The more we search into nature, the more we shall find how little she is known; and we shall more than once have occasion to find, that protracted inquiry is more apt to teach us modesty, than to produce information. Although the number and nature of quadrupeds at first glance seems very well known; yet, when we come to examine closer, we find some with which we are very partially acquainted, and others that are utterly unknown. There is scarcely a cabinet of the curious but what has the spoils of animals, or the horns or the hoofs of quadrupeds, which do not come within former descriptions. There is scarcely a person whose trade is to dress or improve furs, but knows several creatures by their skins, which no naturalist has hitherto had notice of. But of all quadrupeds, there is none so justly the reproach of natural historians, as that which bears the musk. This perfume, so well known to the elegant, and so very useful in the hands of the physician, a medicine that has for more than a century been imported from the East in great quantities, and during all that time has been improving in its reputation, is nevertheless so very little understood, that it remains a doubt whether the animal that produces it be a hog, an ox, a goat, or a deer. When an animal with which we are so nearly connected, is so utterly unknown, how little must we know of many that are more remote and unserviceable! Yet naturalists proceed in the same train, enlarging their catalogues and their names, without endeavouring to find out the nature, and fix the precise history, of those with which we are very partially acquainted. It is the spirit of the scholars of the present age to be fonder of increasing the bulk of our knowledge, than its utility; of extending their conquests, than of improving their empire.

The musk which comes to Europe, is brought over in small bags, about the size of a pigeon's egg, which when cut open, appear to contain a kind of dusky reddish substance, like coagulated blood, and which in large quantities, has a very strong smell; but, when mixed and diffused, becomes a very agreeable perfume. Indeed, no substance now known in the world has a stronger or a more permanent smell. A grain of musk perfumes a whole room; and its odour continues for some days without diminution. But in a larger quantity it continues for years together, and seems scarcely wasted in its weight, although it has filled the atmosphere to a great distance with its parts. It is particularly used in medicine, in nervous and hysteric disorders; and is found in such cases to be the most powerful remedy now in use: however, the animal that furnishes this admirable medicine has been very variously described, and is known but very imperfectly.

The description given of this animal by Grew is as follows: "The musk animal is properly neither of the goat nor deer kind, for it has no horns, and it is uncertain whether it ruminates or not; however, it wants the fore-teeth in the upper jaw, in the same manner as in the ruminating animals; but at the same time, it has tusks like those of a hog. It is three feet six inches in length, from the head to the tail; and the head is above half-a-foot long. The fore-part of the head is like that of a greyhound; and the ears are three inches long, and erect, like those of a rabbit; but the tail is not above two inches. It is cloven-footed, like beasts of the goat kind: the hair on the head and legs is half an inch long, on the belly an inch and a half, and on the back and buttocks three inches, and proportionably thicker than in any other animal. It is brown and white alternately from the root to the point; on the head and thighs it is brown, but under the belly and tail white, and a little curled, especially on the back and belly. On each side of the lower jaw, under the corners of the mouth, there is a tuft of thick hair, which is short and hard, and about three quarters of an inch long. The hair in general of this animal is remarkable for its softness and fine texture; but what distinguishes it particularly are the tusks, which are an inch and a half long, and turn back in the form of a hook; and more particularly the bag which contains the musk, which is three inches long, two broad, and stands out from the belly an inch and a half. It is a very fearful animal, and therefore it has long ears, and the sense of hearing is so quick that it can discover an enemy at a great distance.

After so long and circumstantial a description of this animal, its nature is but very little known; nor has any anatomist as yet examined its internal structure, or been able to inform us whether it be a ruminant animal, or one of the hog kind; how the musk is formed, or whether those bags in which it comes to us be really belonging to the animal, or are only the sophistications of the venders. Indeed, when we consider the immense quantities of this substance which are consumed in Europe alone, not to mention the East, where it is in still greater repute than here, we can hardly suppose that any one animal can furnish the supply; and particularly when it must be killed before the bag can be obtained. We are told, it is true, that the musk is often deposited by the animal upon trees and stones, against which it rubs itself when the quantity becomes uneasy; but it is not in that form which we receive it, but always in what seems to be its own natural bladder. Of these Tavernier brought home near two thousand in one year; and as the animal is wild, so many must during that space have been hunted and taken. But as the creature is represented very shy, and as it is found but in some particular provinces of the East, the wonder is, how its bag should be so cheap, and furnished in such great plenty. The bag in common does not cost (if I do not forget) above a crown by retail, and yet this is supposed the only one belonging to the animal; and for the obtaining of which, it must have been hunted and killed. The only way of solving this difficulty, is to suppose that these bags are, in a great measure, counterfeit, taken from some other animal, or from some part of the same, filled with its blood, and a very little of the perfume, but enough to impregnate the rest with a strong and permanent odour. It comes to us from different parts of the East; from China, Tonquin, Bengal, and often from Muscovy; that of Thibet is reckoned the best, and sells for fourteen shillings an ounce; that of Muscovy the worst, and sells but for three; the odour of this, though very strong at first, being quickly found to evaporate. Musk was some years ago in the highest request as a perfume, and but little regarded as a medicine; but at present its reputation is totally changed; having been found of great benefit in physic, it is but little regarded for the purposes of elegance. It is thus that things which become necessary, cease to continue pleasing: and the consciousness of their use, destroys their power of administering delight.

SUPPLEMENTARY NOTE.

The musk animals (of which there are now ascertained to be *six* species), are inhabitants, almost exclusively, of India and the Indian isles. Two or three of the species are so small, as scarcely to exceed a rabbit in size. They are very gentle, but exceedingly timid; on the appearance of a man they fly with precipitation into the recesses of their native wilds. The whole genus are without horns; with eight teeth in the lower jaw; with tusks in the upper jaw, which are solitary, and projecting. The species described by our author is the Thibetian musk; it lives retired amongst the highest and rudest mountains of Thibet, and some other parts of Asia, Tonquin, and Siberia. In the autumn large flocks of them collect together, in order to change their place, being driven southward by the approaching cold. During this migration the peasants lie in wait for them, and either catch them by means of snares, or kill them with bludgeons. At these times they are often so meagre and languid, from hunger and fatigue, as to be taken without much difficulty. They are gentle and timid, having no weapons of defence but their tusks. Their activity is very great, and they are able to take astonishing leaps over the tremendous chasms of the rocks. They tread so lightly on the snow, as scarcely to leave a mark, while the dogs that are employed in the pursuit of them sink in, and are frequently obliged to desist from the chase. In a state of captivity they live but a very short time. They feed on various vegetables of the mountains. They are usually taken in snares, or shot by cross-bows placed in their tracks, with a string from the trigger for them to tread on, and discharge the bow. It is generally asserted, that when the musk-bag is first opened, so powerful an odour comes from it that every person present is obliged to cover his mouth and nose with several folds of linen; and that, notwithstanding this precaution, the blood will frequently gush from the nose. When the musk is fresh, a very small quantity in a confined place is insupportable; it causes giddiness in the head, and hemorrhages which have sometimes proved fatal. Besides being of use on account of the musk they produce, the skins of these animals, in many of the countries where they are found, are used as winter clothing. The Russians scrape off the hair, and have a method of preparing the leather so as to render it as soft and shining as silk; this they adopt as part of their summer dress.

The Indian musk is larger than the Thibet musk; it has a head like that of a horse; ears erect, and oblong; its legs are slender, with spurious hoofs; body above of a tawny colour, and beneath whitish. Inhabits several parts of India.

The Guinea musk is a native of many parts of India and Java; it is only nine inches and a half in length; its body is of a brown tawny colour, white beneath; its tail is very short, being only one inch long. It has long erect ears; two broad middle fore-teeth, the rest are slender; its tusks are very small. This is the animal which our author has confounded with the pigmy antelope, as mentioned in a previous note. There is a variety of the Guinea musk, with its body of a rusty colour, mixed with black, with perpendicular stripes on its neck and throat.

The Meminna or Ceylon musk, is an inhabitant of the islands of Ceylon and Java; it is seventeen inches long, with long erect ears and short tail; its body is of a cinereous yellow above, and white beneath; its sides are spotted with white. It very much resembles the *fallow deer*.

The Java musk inhabits the island of Java; is about the size of a rabbit; its body above is of a ferruginous colour, beneath longitudinally white; its tail is longish, hairy, and white beneath at the tip. Its nose and ears are naked, with pits under the eyebrows; its neck is of a gray colour, mixed with brown hairs, and beneath white, with gray spots almost connected. Under the throat it has two long divergent hairs; crown of the head longitudinally blackish.

The Brazilian musk is a native of Guinea and Brazil; it is a hardy animal, as large as a roe, timid, active, and swift; its body is tawny-brown, with a black mouth, and white throat; its hair is soft and short; its head and neck on the upper part brown, under white; its hind legs are longer than the fore; and its ears are four inches long.

CHAP. V.

ANIMALS OF THE DEER KIND.

IF we compare the stag and the bull, as to shape and form, no two animals can be more unlike: and yet, if we examine their internal structure, we shall find a striking similitude between them. Indeed, their differences, except to a nice observer, will scarcely be perceivable. All of the deer kind want the gall-bladder: their kidneys are formed differently; their spleen is also proportionably larger; their tail is shorter; and their horns, which are solid, are renewed every year.[1] Such are the slight internal discriminations between two animals, one of which is among the swiftest and the other the heaviest of the brute creation.

The stag is one of those innocent and peaceable animals that seem made to embellish the forests, and animate the solitudes of nature. The easy elegance of his form, the lightness of his motions, those large branches that seem made rather for the ornament of his head than its defence, the size, the strength, and the swiftness, of this beautiful creature, all sufficiently rank him among the most noted objects of human curiosity.

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[1] The quadrupeds of this tribe have horns which are solid and branched: they are renewed every year, and when young are clothed with a fine velvety vascular skin, which falls off when the horns have attained their full size. In the lower jaw they have eight front teeth: and are generally destitute of canine teeth: but sometimes a single one is found on each side on the upper jaw. There are about fourteen distinct species. They are all extremely active, inhabiting chiefly woods and neglected situations; and in fighting not only make use of their horns, but stamp furiously with their fore-feet.—ED.

The stag or hart, whose female is ca'led a *hind*, and the young a *calf*, differs in size and in horns from a fallow deer. He is much larger and his horns are round; whereas in the fallow-kind they are broad and palmated. By these the animal's age is known. The first year the stag has no horns, but a horny excrescence, which is short, rough, and covered with a thin hairy skin. The next year the horns are single and straight: the third year they have two antlers, three the fourth, four the fifth, and five the sixth; this number is not always certain, for sometimes there are more, and often less. When arrived at the sixth year, the antlers do not always increase; and although the number may amount to six or seven on each side, yet the animal's age is then estimated rather from the size of the antlers, and the thickness of the branch which sustains them, than from their variety. These horns, large as they seem, are, notwithstanding, shed every year and new ones come in their place. The old horns are of a firm solid texture, and usually employed in making handles for knives and other domestic utensils. But while young, nothing can be more soft and tender; and the animal, as if conscious of his own imbecility at those times, instantly, upon shedding his former horns, retires from the rest of his fellows, and hides himself in solitudes and thickets, never venturing out to pasture, except by night. During this time, which most usually happens in the spring, the new horns are very painful, and have a quick sensibility of any external impression. The flies also are extremely troublesome to him. When the old horn is fallen off, the new does not begin immediately to appear; but the bones of the skull are seen covered only with a transparent periosteum or skin, which, as anatomists teach us, covers the bones of all animals. After a short time, however, this skin begins to swell, and to form a soft tumour, which contains a great deal of blood, and which begins to be covered with a downy substance that has the feel of velvet, and appears nearly of the same colour with the rest of the animal's hair. This tumour every day buds forward from the point like the graft of a tree, and rising by degrees from the head, shoots out the antlers on either side, so that in a few days, in proportion as the animal is in condition, the whole head is completed. However, as was said above, in the beginning its consistence is very soft, and has a sort of bark, which is no more than a continuation of the integument of the skull. It is velveted and downy, and everywhere furnished with blood-vessels, that supply the growing horns with nourishment. As they creep along the sides of the branches, the print is marked over the whole surface; and the larger the blood-vessels, the deeper these marks are found to be; from hence arises the inequality of the surface of the deer's horns; which, as we see, are furrowed all along the sides, the impressions diminishing towards the point, where the substance is as smooth and as solid as ivory. But it ought to be observed, that this substance of which the horns are composed, begins to harden at the bottom, while the upper part remains soft, and still continues growing: from whence it appears that the horns grow differently in deer from those of sheep or cows; in which they are always seen to increase from the bottom. However, when the whole head has received its full growth, the extremities then begin to acquire their solidity; the velvet covering or bark, with its blood-vessels, dry up, and then begin to fall; and this the animal hastens, by rubbing its antlers against every tree it meets. In this manner, the whole external surface being stripped off by degrees, at length the whole head acquires its complete hardness, expansion, and beauty.

It would be a vain task to inquire into the cause of the animal production of these horns: it is sufficient to observe, that if a stag be castrated when its horns are fallen off, they will never grow again; and, on the contrary, if the same operation is performed when they are on, they will never fall off. If only one of his testicles is taken out, he will want the horn on that side; if one of the testicles only be tied up, he will want the horn of the opposite side. The increase of their provision also tends to facilitate the growth and the expansion of the horns; and Mr. Buffon thinks it possible to retard their growth entirely by greatly retrenching their food.[2] As a proof of this, nothing can be more obvious than the difference between a stag bred in fertile pastures, and undisturbed by the hunter, and one often pursued and ill nourished. The former has its head expanded, his antlers numerous, and the branches thick; the latter has but few antlers, the traces of the blood-vessels upon them are but slight, and the expansion but little. The beauty and size of their horns, therefore, mark their strength and their vigour: such of them as are sickly, or have been wounded, never shooting out that magnificent profusion so much admired in this animal. Thus the horns may, in every respect, be resembled to a vegetable substance, grafted upon the head of an animal. Like a vegetable, they grow from the extremities; like a vegetable, they are for a while covered with a bark that nourishes them; like a vegetable, they have their annual production and decay; and a strong imagination might suppose that the leafy productions on which the animal feeds, go once more to vegetate in his horns.[3]

The stag is usually a twelvemonth old before the horns begin to appear, and then a single

[2] Mr. Buffon, vol. xi. p. 113.

[3] Mr. Buffon has supposed something like this. *Vide Passim.*

branch is all that is seen for the year ensuing. About the beginning of spring, all of this kind are seen to shed their horns, which fall off of themselves; though sometimes the animal assists the efforts of nature, by rubbing them against a tree. It seldom happens that the branches on both sides fall off at the same time, there often being two or three days between the dropping of the one and the other. The old stags usually shed their horns first; which generally happens towards the latter end of February, or the beginning of March. Those of the second head, (namely, such as are between five and six years old,) shed their horns about the middle or latter end of March: those still younger, in the month of April; and the youngest of all, not till the middle, or the latter end of May; they generally shed them in pools of water, whither they retire from the heat; and this has given rise to the opinion of their always hiding their horns. These rules, though true in general, are yet subject to many variations; and universally it is known, that a severe winter retards the shedding of the horns. The horns of the stag generally increase in thickness and in height, from the second year of its age to the eighth. In this state of perfection they continue during the vigour of life; but as the animal grows old, the horns feel the impressions of age, and shrink like the rest of the body. No branch bears more than twenty or twenty-two antlers, even in the highest state of vigour; and the number is subject to great variety; for it happens that the stag at one year has either less or more than the year preceding, in proportion to the goodness of his pasture, or the continuance of his security, as these animals seldom thrive when often roused by the hunters. The horns are also found to partake of the nature of the soil: in the more fertile pastures they are large and tender; on the contrary, in the barren soil, they are hard, stunted, and brittle. As soon as the stags have shed their horns, they separate from each other, and seek the plainer parts of the country, remote from every other animal, which they are utterly unable to oppose. They then walk with their heads stooping down, to keep their horns from striking against the branches of the trees above. In this state of imbecility they continue near three months, before their heads have acquired their full growth and solidity; and then, by rubbing them against the branches of every thicket, they at length clear them of the skin which had contributed to their growth and nourishment. It is said by some, that the horn takes the colour of the sap of the tree against which it is rubbed; and that some thus become red, when rubbed against the heath; and others brown, by rubbing against the oak: this, however, is a mistake; since stags kept in parks where there are no trees, have a variety in the colour of their horns, which can be ascribed to nothing but nature. A short time after they have furnished their horns, they begin to feel the impressions of the rut, or the desire of copulation. The old ones are the most forward; and about the end of August, or the beginning of September, they quit their thickets, and return to the mountain in order to seek the hind, to whom they call with a loud tremulous note. At this time their neck is swollen; they appear bold and furious; fly from country to country; strike with their horns against the trees and other obstacles, and continue restless and fierce until they have found the female; who at first flies from them, but is at last compelled and overtaken. When two stags contend for the same female, how timorous soever they may appear at other times, they then seem agitated with an uncommon degree of ardour. They paw up the earth, menace each other with their horns, bellow with all their force, and striking in a desperate manner against each other, seem determined upon death or victory. This combat continues till one of them is defeated or flies; and it often happens that the victor is obliged to fight several of those battles before it remains undisputed master of the field. The old ones are generally the conquerors upon these occasions, as they have more strength and greater courage; and these also are preferred by the hind to the young ones, as the latter are more feeble, and less ardent. However, they are all equally inconstant, keeping to the female but a few days, and then seeking out for another, not to be enjoyed, perhaps, without a repetition of their former danger.

In this manner the stag continues to range from one to the other for about three weeks, the time the rut continues; during which he scarcely eats, sleeps, or rests, but continues to pursue, to combat, and to enjoy. At the end of this period of madness, for such in this animal it seems to be, the creature that was before fat, sleek, and glossy, becomes lean, feeble, and timid. He then retires from the herd to seek plenty and repose; he frequents the side of the forest, and chooses the most nourishing pastures, remaining there till his strength is renewed. Thus is his whole life passed in the alternations of plenty and want, of corpulence and inanition, of health and sickness, without having his constitution much affected by the violence of the change. As he is above five years coming to perfection, he lives about forty years; and it is a general rule, that every animal lives about seven or eight times the number of years which it continues to grow. What, therefore, is reported concerning the life of this animal, has arisen from the credulity of ignorance: some say, that a stag having been taken in France, with a collar, on which were written these words, "Cæsar; hoc me donavit;" this was interpreted of Julius Cæsar; but it is not considered that Cæsar is a general name for kings, and that one of the emperors of Germany, who are always styled Cæsars, might have ordered the inscription.

This animal may differ in the term of his life according to the goodness of his pasture, or the undisturbed repose he happens to enjoy. These are advantages that influence not only his age, but his size and his vigour. The stags of the plains, the valleys, and the little hills, which abound in corn and pasture, are much more corpulent and much taller than such as are bred on the rocky waste, or the heathy mountain. The latter are low, small, and meagre, incapable of going so swift as the former, although they are found to hold out much longer. They are also more artful in evading the hunters; their horns are generally black and short, while those of the lowland stags are reddish and flourishing; so that the animal seems to increase in beauty and stature in proportion to the goodness of the pasture, which he enjoys in security.

The usual colour of the stag in England was red; nevertheless, the greater number in other countries are brown. There are some few that are white; but these seem to have obtained this colour in a former state of domestic tameness. Of all the animals that are natives of this climate, there are none that have such a beautiful eye as the stag; it is sparkling, soft, and sensible. His senses of smelling and hearing are in no less perfection. When he is in the least alarmed, he lifts the head and erects the ears, standing for a few minutes as if in a listening posture. Whenever he ventures upon some unknown ground, or quits his native covering, he first stops at the skirt of the plain to examine all around; he next turns against the wind, to examine by the smell if there be any enemy approaching. If a person should happen to whistle or call out, at a distance, the stag is seen to stop short in his slow-measured pace, and gazes upon the stranger with a kind of awkward admiration; if the cunning animal perceives neither dogs nor fire-arms preparing against him, he goes forward, quite unconcerned, and slowly proceeds without offering to fly. Man is not the enemy he is most afraid of; on the contrary, he seems to be delighted with the sound of the shepherd's pipe; and the hunter sometimes makes use of that instrument to allure the poor animal to his destruction.[4]

The stag eats slowly, and is very delicate in the choice of his pasture. When he has eaten a sufficiency, he then retires to the covert of some thicket to chew the cud in security. His rumination, however, seems performed with much greater difficulty than with the cow or sheep: for the grass is not returned from the first stomach without much straining, and a kind of hiccup, which is easily perceived during the whole time it continues. This may proceed from the greater length of his neck, and the narrowness of the passage, all those of the cow and the sheep kind having it much wider.

This animal's voice is much stronger, louder, and more tremulous, in proportion as he advances in age; in the time of rut it is even terrible. At that season he seems so transported with passion. that nothing obstructs his fury; and, when at bay, he keeps the dogs off with great intrepidity Some years ago, William Duke of Cumberland caused a tiger and a stag to be enclosed in the same area; and the stag made so bold a defence that the tiger was at last obliged to fly. The stag seldom drinks in winter, and still less in the spring while the plants are tender and covered over with dew. It is in the heat of summer, and during the time of rut, that he is seen constantly frequenting the sides of rivers and lakes, as well to slake his thirst as to cool his ardour. He swims with great ease and strength, and best at those times when he is fattest, his fat keeping him buoyant, like oil upon the surface of the water. During the time of rut he even ventures out to sea, and swims from one island to another although there may be some leagues' distance between them.

The cry of the hind, or female, is not so loud as that of the male, and is never excited but by apprehension for herself or her young. It need scarcely be mentioned that she has no horns, or that she is more feeble or unfit for hunting than the male. When once they have conceived, they separate from the males, and then they both herd apart. The time of gestation continues between eight and nine months, and they generally produce but one at a time. Their usual season for bringing forth is about the month of May, or the beginning of June, during which they take great care to hide their young in the most obscure thickets. Nor is this precaution without reason, since almost every creature is then a formidable

[4] The stag is capable of being tamed, when it becomes rather petulant and dangerous, and also of being trained to various uses, even to drag a phaeton: —Among the various experiments of a sporting nature, performed by the late Lord Oxford, perhaps none was more eccentric than his determination to drive four red deer stags in a phaeton, instead of horses, and these he had reduced to perfect discipline for his excursions and short journeys upon the road; but, unfortunately, as he was one day driving to Newmarket, their ears were saluted with the cry of a pack of hounds, which, soon after crossing the road in the rear, caught scent of the "four in hand," and commenced a new kind of chase, with "breast-high" alacrity. The novelty of this scene was rich beyond description; in vain did his Lordship exert all his charioteering skill; in vain did his well-trained grooms energetically endeavour to ride before them; reins, trammels, and the weight of the carriage, were of no effect, for they went with the celerity of a whirlwind; and this modern Phaëton, in the midst of his electrical vibrations of fear, bid fair to experience the fate of his namesake. Luckily, however, his Lordship had been accustomed to drive this set of "fiery-eyed steeds" to the Ram Inn, at Newmarket, which was most happily at hand; and to this his Lordship's most fervent prayers and ejaculations had been ardently directed. Into the yard they suddenly bounded, to the consternation of hostlers and stable boys, who seemed to have lost every faculty upon the occasion. Here they were luckily overpowered, and the stags, the phaeton, and his Lordship, were all instantaneously huddled together in a barn, just as the hounds appeared in full cry at the gate.—ED.

enemy. The eagle, the falcon, the osprey, the wolf, the dog, and all the rapacious family of the cat kind, are in continual employment to find out her retreat. But what is more unnatural still, the stag himself is a professed enemy, and she is obliged to use all her arts to conceal her young from him, as from the most dangerous of her pursuers. At this season, therefore, the courage of the male seems transferred to the female; she defends her young against her less formidable opponents by force; and when pursued by the hunter, she ever offers herself, to mislead him from the principal object of her concern. She flies before the hounds for half the day, and then returns to her young, whose life she has thus preserved at the hazard of her own. The *calf*, for so the young of this animal is called, never quits the dam during the whole summer; and in winter, the hind, and all the males under a year old, keep together, and assemble in herds, which are more numerous in proportion as the season is more severe. In the spring they separate; the hinds to bring forth, while none but the year-olds remain together: these animals are, however, in general fond of herding and grazing in company; it is danger or necessity alone that separates them.

The dangers they have to fear from other animals are nothing when compared to those from man. The men of every age and nation have made the chase of the stag one of their most favourite pursuits; and those who first hunted from necessity have continued it for amusement. In our own country, in particular, hunting was ever esteemed as one of the principal diversions of the great.[5] At first, indeed, the beasts of chase had the whole island for their range, and knew no other limits than those of the ocean.

The Roman jurisprudence, which was formed on the manners of the first ages, established it as a law, that as the natural right of things which have no master belongs to the first possessor, wild beasts, birds, and fishes, are the property of whosoever could first take them. But the northern barbarians who overran the Roman empire, bringing with them the strongest relish for this amusement, and being now possessed of more easy means of subsistence from the lands they had conquered, their chiefs and leaders began to appropriate the right of hunting, and, instead of a natural right, to make it a royal one. When the Saxon kings, therefore, had established themselves into a heptarchy, the chases were reserved by each sovereign for his own particular amusement. Hunting and war, in those uncivilized ages, were the only employment of the great. Their active, but uncultivated minds were susceptible of no pleasures but those of a violent kind, such as gave exercise to their bodies, and prevented the uneasiness of thinking. But as the Saxon kings only appropriated those lands to the business of the chase which were unoccupied before, so no individual received any injury. But it was otherwise when the Norman kings were settled upon the throne. The passion for hunting was then carried to an excess, and every civil right was involved in general ruin. This ardour for hunting was stronger than the consideration of religion, even in a superstitious age. The village communities, nay, even the most sacred edifices, were thrown down, and all turned into one vast waste, to make room for animals, the object of a lawless tyrant's pleasure. Sanguinary laws were enacted to preserve the game; and, in the reigns of William Rufus and Henry I., it was less criminal to destroy one of the human species than a beast of chase. Thus it continued while the Norman line filled the throne; but when the Saxon line was restored, under Henry II., the rigour of the forest laws was softened. The barons also, for a long time, imitated the encroachments, as well as the amusements, of the monarch; but when property became more equally divided, by the introduction of arts and industry, these extensive hunting grounds became more limited; and as tillage and husbandry increased, the beasts of chase were obliged to give way to others more useful to the community. Those vast tracts of land, before dedicated to hunting, were then contracted; and, in proportion as the useful arts gained ground, they protected and encouraged the labours of the industrious, and repressed the licentiousness of the sportsman. It is, therefore, among the subjects of a despotic government only, that these laws remain in full force—where large wastes lie uncultivated for the purposes of hunting—where the husbandman can find no protection from the invasions of his lord, or the continual depredations of those animals which he makes the object of his pleasure.

In the present cultivated state of this country, therefore, the stag is unknown in its wild state; and such of them as remain among us are kept, under the name of *red deer*, in parks among the fallow deer. But they are become less common than formerly; its excessive viciousness during the rutting-season, and the badness of its flesh, inducing most people to part with the species.[6]

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[5] British Zoology.

[6] In the summer of 1836, the Hon. F. Maule and his lady had occasion to leave Taymouth castle in their open carriage, and at taking leave, their noble host, the Marquis of Breadalbane, recommended Mr. Maule to drive through the deer-park, that they might enjoy some interesting views. Mr. Maule jocularly remarked that by doing so he might expose himself to "a visit from an old friend," viz., a fine hart—one of the beautiful race of red deer at Taymouth, who was not at all times very civil to those he met with in the park. The coachman, however, received directions to proceed by the park in question, and had not gone far when the deer made his appearance, showing the utmost determination to attack the vehicle. Mr. Maule endeavoured to frighten the animal away by shouting aloud, but he continued to menace the party for some time, and a

The few that still remain wild are to be found on the moors that border on Cornwall and Devonshire; and in Ireland, on most of the large mountains of that country.

In England, the hunting the stag and the buck are performed in the same manner; the animal is driven from some gentleman's park, and then nunted through the open country. But those who pursue the wild animal have a much higher object, as well as a greater variety in the chase. To let loose a creature that was already in our possession, in order to catch it again, is, in my opinion, but a poor pursuit, as the reward, when obtained, is only what we before had given away. But to pursue an animal that owns no proprietor, and which he that first seizes may be said to possess, has something in it that seems at least more rational; this rewards the hunter for his toil, and seems to repay his industry. Besides, the superior strength and swiftness of the wild animal prolongs the amusement; it is possessed of more various arts to escape the hunter, and leads him to precipices where the danger ennobles the chase. In pursuing the animal let loose from a park, as it is unused to danger, it is but little versed in the stratagems of escape; the hunter follows as sure of overcoming, and feels none of those alternations of hope and fear which arise from the uncertainty of success.[7] But it is otherwise with the mountain stag: having spent his whole life in a state of continual apprehension—having frequently been followed, and as frequently escaped, he knows every trick to mislead, to confound, or intimidate his pursuers—to stimulate their ardour, and enhance their success.[8]

Those who hunt this animal have their peculiar terms for the different objects of their pursuit. The professors in every art take a pleasure in thus employing a language known only to themselves, and thus accumulate words which to the ignorant have the appearance of knowledge. In this manner, the stag is called the first year, a *calf*, or *hind-calf;* the second, a *knobber;* the third, a *brock;* the fourth, a *staggard;* the fifth, a *stag;* the sixth, a *hart.* The female is called a *hind:* the first year she is a *calf;* the second, a *hearse;* the third a *hind.* This animal is said to *harbour* in the place where he resides. When he cries, he is said to *bell;* the print of his hoof is called the *slot;* his tail is called the *single;* his excrement, the *fumet:* his horns are called his *head;* when simple, the first year they are called *broches;* the third year, *spears;* the fourth year that part which bears the antlers is called the *beam,* and the little impressions upon its surface, *glitters;* those which rise from the crust of the beam are called *pearls.* The antlers also have distinct names; the first that branches off is called the *antler;* the second the *sur-antler;* all the rest which grow afterwards, till you come to the top, which is called the *crown,* are called *royal-antlers;* the little buds about the tops are called *croches.* The impression on the place where the stag has lain, is called the *layer.* If it be in covert or thicket, it is called his *harbour.* When a deer has passed into a thicket, leaving marks whereby his bulk may be guessed, it is called an *entry.* When they cast their heads, they are said to *mew.* When they rub their heads against trees, to bring off the peel of their horns, they are said to *fray.* When a stag hard hunted takes to swimming in the water, he is said to *go sail;* when he turns his head against the hounds, he is said to *bay;* and when the hounds pursue upon the scent, until they have unharboured the stag, they are said to *draw on the slot.*

Such are but a few of the many terms used by hunters in pursuing of the stag, most of which are now laid aside, or in use only among gamekeepers. The chase, however, is continued in many parts of the country where the red deer is preserved, and still makes the amusement of such

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length, having got in front of the horses, at one plunge fairly struck his enormous antlers into the chest of one of them, and severed the jugular vein. The horses at this got restiff, and the carriage by the merest chance, and the exertions of the postilions, very providentially escaped being precipitated over a large bank. The horse that was struck fell down when the carriage got to the turnpike road, near the entrance-gate of the park, and died from the effects of the wound four hours afterwards. This same red deer, or 'old friend,' has been a long time the terror of the visitors, and about ten years ago killed another horse.—Ed.

[7] The chase of the emparked deer is often a more arduous affair, and affords more excitement to the sportsman, than Goldsmith seems here to imagine. The run which the celebrated Ripley deer gave on the 8th of April, 1830, is perhaps the most extraordinary on record. "He was turned out near Maidenhead, on the Berkshire side of the Thames, which he immediately crossed; and, passing by Sir George Warrender's, he ran over an immense and magnificent tract of country, under a burning sun, to Finchley, where he was taken at 5 o'clock in the evening, the hounds having been laid on at half-past 11 o'clock in the morning. The hounds returned to their own kennel the same night; and, even supposing his line to have been quite straight, an inspection of the map will make the distance appear almost incredible. Some of the habits of this animal are, however, too remarkable to be forgotten. With a ticklish scent, his tricks were more than a match for any pack, and their huntsman to boot. He would generally run hard for the first half hour, then stop to listen; and, if time allowed, would run his line back for a quarter of a mile or so, and then start off in a fresh direction at the top of his speed; in which case, if the hounds were held forward at their check from a reliance on his usually straight mode of running, he insured an immense advantage, and knew well how to make use of it. Another ruse was,—after running an hour or more, to take soil in some large piece of water, and, crouching under the bank, to hide every part of himself but his nostrils; and in this way he has often been lost for hours. He was fond of leaping, and very adverse to roads, till the winter of 1838, when he turned cunning, as it is termed, and would seldom leave them. This naturally caused dissatisfaction, and after a fair trial in different parts of the country, poor Ripley was destroyed in the summer of 1839."—Ed.

[8] See Supplementary Note A, p. 345

as have not found out more liberal entertainments. In those few places where the animal is perfectly wild, the amusement, as was said above, is superior. The first great care of the hunter, when he leads out his hounds to the mountain side, where the deer are generally known to harbour, is to make choice of a proper stag to pursue. His ambition is to unharbour the largest and the boldest of the whole herd; and for this purpose he examines the track, if there be any, which if he finds long and large, he concludes that it must have belonged to a stag, and not a hind, the print of whose foot is rounder. Those marks also which he leaves on trees, by the rubbing of his horns, show his size, and point him out as the proper object of pursuit. Now to seek out a stag in his haunt, it is to be observed, that he changes his manner of feeding every month. From the conclusion of rutting time, which is in November, he feeds on heaths and broomy places. In December, they herd together, and withdraw into the strength of the forests, to shelter themselves from the severer weather, feeding on holm, elder-trees, and brambles. The three following months they leave herding, but keep four or five in a company, and venture out to the corners of the forest, where they feed on winter pasture, sometimes making their incursions into the neighbouring cornfields, to feed upon the tender shoots, just as they peep above ground. In April and May they rest in thickets and shady places, and seldom venture forth unless roused by approaching danger. In September and October their annual ardour returns; and then they leave the thickets, boldly facing every danger, without any certain place for food or harbour. When, by a knowledge of these circumstances, the hunter has found out the residence, and the quality of his game, his next care is to uncouple and cast off his hounds in the pursuit; these no sooner perceive the timorous animal that flies before them, but they altogether open in full cry, pursuing rather by the scent than the view, encouraging each other to continue the chase, and tracing the flying animal with the most amazing sagacity. The hunters also are not less ardent in their speed on horseback, cheering up the dogs, and directing them where to pursue. On the other hand, the stag, when unharboured, flies at first with the swiftness of the wind, leaving his pursuers several miles in the rear, and at length having gained his former coverts, and no longer hearing the cries of the dogs and men that he had just left behind, he stops, gazes round him, and seems to recover his natural tranquillity. But this calm is of short duration, for his inveterate pursuers slowly and securely trace him along, and he once more hears the approaching destruction from behind. He again, therefore, renews his efforts to escape, and again leaves his pursuers at almost the former distance; but this second effort makes him more feeble than before, and when they come up a second time, he is unable to outstrip them with equal velocity. The poor animal now, therefore, is obliged to have recourse to all his little arts of escape, which sometimes, though but seldom, avail him. In proportion as his strength fails him, the ardour of his pursuers is inflamed; he tracks more heavily on the ground, and this increasing the strength of the scent, redoubles the cries of the hounds, and enforces their speed. It is then that the stag seeks for refuge among the herd, and tries every artifice to put off some other head for his own. Sometimes he will send forth some little deer in his stead, in the meantime lying close himself that the hounds may overshoot him. He will break into one thicket after another, to find deer, rousing them, gathering them together, and endeavouring to put them upon the tracks he has made. His old companions, however, with a true spirit of ingratitude, now all forsake and shun him with the most watchful industry, leaving the unhappy creature to take his fate by himself. Thus abandoned of his fellows, he again tries other arts, by doubling and crossing in some hard-beaten highway, where the scent is least perceivable. He now also runs against the wind, not only to cool himself, but the better to hear the voice, and judge of the distance of his implacable pursuers. It is now easily perceivable how sorely he is pressed, by his manner of running, which from the bounding easy pace with which he began, is converted into a stiff and short manner of going; his mouth also is black and dry, without foam on it; his tongue hangs out; and the tears, as some say, are seen starting from his eyes. His last refuge, when every other method of safety has failed him, is to take the water, and to attempt an escape by crossing whatever lake or river he happens to approach. While swimming, he takes all possible care to keep in the middle of the stream, lest by touching the bough of a tree or the herbage on the banks, he may give scent to the hounds. He is also ever found to swim against the stream; whence the huntsmen have made it into a kind of proverb, *That he that would his chase find, must up with the river and down with the wind.* On this occasion too he will often cover himself under water so as to show nothing but the tip of his nose. Every resource and every art being at length exhausted, the poor creature tries the last remains of his strength, by boldly opposing those enemies he cannot escape; he therefore faces the dogs and men, threatens with his horns, guards himself on every side, and for some time stands at bay. In this manner, quite desperate, he furiously aims at the first dog or man that approaches, and it often happens that he does not die unrevenged.[9] At that time, the more prudent both of the dogs and men, seem willing to avoid him; but the whole pack quickly coming up, he is soon surrounded and brought down, and the huntsman winds a *treble mort*, as it is called, with his horn.

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[9] A wound from a stag's horn was deemed poisonous by our ancestors, as the old rhyme testifies:

> If thou be hurt with hart it brings thee to thy bier.
> But barber's hand will boar's hurt heal, thereof thou
> need'st not fear.

Such is the manner of pursuing this animal in England; but every country has a peculiar method of its own, adapted either to the nature of the climate, or the face of the soil. The ancient manner was very different from that practised at present; they used their dogs only to find out the game, but not to rouse it. Hence they were not curious as to the music of their hounds, or the composition of their pack; the dog that opened before he had discovered his game, was held in no estimation. It was their usual manner silently to find out the animal's retreat, and surround it with nets and engines, then to drive him up with all their cries, and thus force him into the toils which they had previously prepared. In succeeding times the fashion seemed to alter; and particularly in Sicily, the manner of hunting was as follows. The nobles and gentry being informed which way a herd of deer passed, gave notice to one another, and appointed a day of hunting. For this purpose, every one was to bring a cross-bow, or a long-bow, and a bundle of staves shod with iron, the heads bored, with a cord passing through them all. Thus provided, they came to where the herd continued grazing, and casting themselves about in a large ring, surrounded the deer on every side. Then each taking his stand, unbound his fagot, set up his stake, and tied the end of the cord to that of his next neighbour, at the distance of about ten feet one from the other. Between each of these stakes was hung a bunch of crimson feathers, and so disposed, that with the least breath of wind they would whirl round, and preserve a sort of fluttering motion. This done, the persons who set up the staves withdrew, and hid themselves in the neighbouring coverts; then the chief huntsman, entering with his hounds within the lines, roused the game with a full cry. The deer, frighted and flying on all sides, upon approaching the lines, were scared away by the fluttering of the feathers, and wandered about within this artificial paling, still awed by the shining and fluttering plumage that encircled their retreat; the huntsman, however, still pursuing, and calling every person by name, as he passed by their stand, commanded him to shoot the first, third, or sixth, as he pleased; and if any of them missed, or singled out another than that assigned him, it was considered as a most shameful mischance. In this manner, however, the whole herd was at last destroyed; and the day concluded with mirth and feasting.[10]

The stags of China are of a particular kind, for they are no taller than a common house-dog; and hunting them is one of the principal diversions of the great. Their flesh while young is exceedingly good; but when they arrive at maturity, it begins to grow hard and tough: however, the tongue, the muzzle, and the ears, are in particular esteem among that luxurious people. Their manner of taking them is singular enough: they carry with them the heads of some of the females stuffed, and learn exactly to imitate their cry; upon this the male does not fail to appear, and looking on all sides, perceives the head, which is all that the hunter, who is himself concealed, discovers. Upon their nearer approach, the whole company rise, surround, and often take him alive.

There are very few varieties in the red deer of this country; and they are mostly found of the same size and colour. But it is otherwise in different parts of the world, where they are seen to differ in form, in size, in horns, and in colour.

The stag of Corsica is a very small animal, being not above half the size of those common among us. His body is short and thick, his legs short, and his hair of a dark brown.

There is, in the forests of Germany, a kind of stag, named by the ancients the *Tragelaphus*, and which the natives call the *bran deer*, or the *brown deer*. This is of a darker colour than the common stag, of a lighter shade upon the belly, long hair upon the neck and throat, by which it appears bearded like the goat.

There is also a very beautiful stag, which by some is said to be a native of Sardinia; but others (among whom is Mr. Buffon) are of opinion that it comes from Africa, or the East Indies. He calls it the *axis*, after Pliny; and considers it as making the shade between the stag and the fallow deer. The horns of the axis are round, like those of the stag; but the form of its body entirely resembles that of the buck, and the size also is exactly the same. The hair is of four colours; namely, sallow, white, black, and gray. The white is predominant under the belly, on the inside of the thighs, and the legs. Along the back there are two rows of spots in a right line; but those on other parts of the body are very irregular. A white line runs along each side of this animal, while the head and neck are gray. The tail is black above, and white beneath; and the hair upon it is six inches long.[11]

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[10] Pier Hieroglyph. lib. vii. cap. 6.

[11] There is a group of Asiatic stags, distinguished from all other deer by having round horns with a brow antler, but no median or bezantler, the beam terminating in a single perch, with a snag of more or less length, placed midway, or high up, on the anterior or posterior side of it. The group is further distinguished by having, in common with the true stags, a broad muzzle, canines in the males, large suborbital openings, a rugged mane, lengthened tail, and uniform dark colours of the hair; their stature, in nearly the whole, is large, and like the stag they reside in woody places and have a predilection for water.—ED.

Although there are but few individuals of the deer kind, yet the race seems diffused over all parts of the earth. The new continent of America, in which neither the sheep, the goat, nor the gazelle, have been originally bred, nevertheless produces stags, and other animals of the deer kind, in sufficient plenty. The Mexicans have a breed of white stags in their parks, which they call *stags royal*.[12] The stags of Canada differ from ours in nothing except the size of the horns, which in them is greater; and the direction of the antlers, which rather turn back, than project forward, as in those of Europe.[13] The same difference of size that obtains among our stags is also to be seen in that country; and, as we are informed by Ruysch, the Americans have brought them into the same state of domestic tameness that we have our sheep, goats, or black cattle. They send them forth in the day-time to feed in the forests; and at night they return home with the herdsman who guards them. The inhabitants have no other milk but what the hind produces; and use no other cheese but what is made from thence. In this manner we find, that an animal which seems made only for man's amusement, may be easily brought to supply his necessities. Nature has many stores of happiness and plenty in reserve, which only want the call of industry to be produced, and now remain as candidates for human approbation.[14]

THE FALLOW DEER.

No two animals can be more nearly allied than the stag and the fallow deer.[15] Alike in form, alike in disposition, in the superb furniture of their heads, in their swiftness and timidity; and yet no two animals keep more distinct, or avoid each other with more fixed animosity. They are never seen to herd in the same place, they never engender together, or form a mixed breed; and even in those countries where the stag is common, the buck seems to be entirely a stranger; in short, they both form distinct families; which, though so seemingly near, are still remote; and although with the same habitudes, yet retain an unalterable aversion. The fallow deer, as they are much smaller, so they seem of a nature less robust, and less savage, than those of the stag kind. They are found but rarely wild in the forests; they are, in general, bred up in parks, and kept for the purposes of hunting, or of luxury, their flesh being preferred to that of any other animal. It need scarcely be mentioned, that the horns of the buck make its principal distinction, being broad and palmated; whereas those of the stag are in every part round. In the one, they are flatted and spread like the palm of the hand; in the other, they grow like a tree, every branch being of the shape of the stem that bears it. The fallow deer also has the tail longer, and the hair lighter, than the stag; in other respects, they pretty nearly resemble one another.[16]

The head of the buck, as of all other animals of this kind, is shed every year, and takes the usual time for repairing. The only difference between it and the stag is, that this change happens later in the buck; and its rutting-time consequently falls more into the winter. It is not found so furious at this season as the former; nor does it so much exhaust itself by the violence of its ardour. It does not quit its natural pastures in quest of the female, nor does it attack other animals with indiscriminate ferocity: however, the males combat for the female among each other; and it is not without many contests that one buck is seen to become master of the whole herd. It often happens also that a herd of fallow deer is seen to divide into two parties, and engage each other with great ardour and obstinacy.[17] They both seem desirous of gaining some favourite spot of the park for pasture, and of driving the vanquished party into the coarser and more disagreeable parts. Each of these factions has its particular chief; namely, the two oldest and strongest of the herd. These lead on to the engagement; and the rest follow under their direction. These combats are singular enough, from the disposition and conduct which seems to regulate their mutual efforts. They attack with order, and support the assault with courage; they come to each other's assistance, they retire, they rally, and never give up the victory upon a single defeat. The combat is renewed for several days together; until at length the most feeble side is obliged to give way, and is content to escape to the most disagreeable part of the park, where only they can find safety and protection.

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[12] Buffon, vol. xii. p. 35.

[13] The *wapiti* is a stag of North America, and resembles the common stag in nearly all his proportions, but his size is far superior, being at the shoulder from four feet four to four feet eight inches;* the superiority of bulk appearing chiefly in the magnitude of the body. The hind is similar to the stag with inferior proportions: the colour of both in the summer season is fulvous-brown on the back; a black spot on each side of the corners of the mouth descends on the under lip, round the eye brown, and down the face darker; the neck also is darker than the body, being mixed with a purplish-brown tint on those parts; the limbs are anteriorly dark, and lighter fawn behind. Under the throat long hairs form a sort of dewlap, also darker in colour; the buttocks and tail are pale fawn colour; separated from the brown of the thigh by a dark streak; the tail is short, but varies from two to four inches in length. The suborbital sinus is long, open, and naked next the eye; the ears are long, lined with white hair within, and dark coloured externally. Inside of the limbs and the belly the hair is close and buff coloured.—ED.

[14] In the mountainous parts of Hircania, Russia, and Siberia, is found a species of deer something larger than the roe-buck. The colour is brown, with the outsides of the limbs and under parts of the body yellowish. The hinder parts of the thighs are white, forming a large patch on the back of the animal. The space round the nose and sides of the lower lip are black, but the tip of the lip is white. It has no tail, but a mere broadish excrescence.—ED.

* These dimensions appear superior to M. F. Cuvier's and Dr. Harlan's; but both these gentlemen give the French pouce, and not the English inch.

[15] Buffon, vol. xii. p. 36.

[16] The fallow deer is smaller than the stag; of a brownish bay colour; whitish beneath, on the insides of the limbs, and beneath the tail. The horns, which are peculiar to the male, are very different from those of the stag; they are not properly branched, but are broader towards the upper part, and divided into processes down the outside. A simple antler rises from the base of each, and a similar one at some distance from the first.—ED.

[17] Buffon, vol. xii p. 36.

The fallow deer is easily tamed, and feeds upon many things which the stag refuses. By this means it preserves its venison better; and even after rutting it does not appear entirely exhausted. It continues almost in the same state through the whole year, although there are particular seasons when its flesh is chiefly in esteem. This animal also browzes closer than the stag; for which reason it is more prejudicial among young trees, which it often strips too close for recovery. The young deer eat much faster, and more greedily than the old; they seek the female at their second year; and, like the stag, are fond of variety. The doe goes with young about eight months, like the hind; and commonly brings forth one at a time; but they differ in this, that the buck comes to perfection at three, and lives till sixteen; whereas the stag does not come to perfection till seven, and lives till forty.[18]

As this animal is a beast of chase, like the stag, so the hunters have invented a number of names relative to him. The buck is the first year called a *fawn;* the second, a *pricket;* the third, a *sorel;* the fourth, a *sore;* the fifth, a *buck of the first head;* and the sixth, *a great buck.* The female is called a *doe;* the first year, a *fawn;* and the second a *tegg*. The manner of hunting the buck is pretty much the same as that of stag-hunting, except that less skill is required in the latter. The buck is more easily roused; it is sufficient to judge by the view, and mark what grove or covert it enters, as it is not known to wander far from thence; nor, like the stag, to change his *layer*, or place of repose. When hard hunted, it takes to some stronghold, or covert, with which it is acquainted, in the more gloomy parts of the wood, or the steeps of the mountain; not, like the stag, flying far before the hounds, nor crossing, nor doubling, nor using any of the subtleties which the stag is accustomed to. It will take the water when sore pressed, but seldom a great river; nor can it swim so long or so swiftly as the former. In general, the strength, the cunning, and the courage of this animal, are inferior to those of the stag; and consequently it affords neither so long, so various, nor so obstinate a chase; besides being lighter, and not tracking so deeply, it leaves a less powerful and lasting scent, and the dogs in the pursuit are more frequently at a fault.[19]

As the buck is a more delicate animal than the stag, so also is it subject to greater varieties.[20] We have in England two varieties of the fallow deer, which are said to be of foreign origin: the beautiful spotted kind, which is supposed to have been brought from Bengal; and the very deep brown sort, that are now so common in several parts of this kingdom. These were introduced by King James the First from Norway: for having observed their hardiness, and that they could endure the winter, even in that severe climate, without fodder, he brought over some of them into Scotland, and disposed of them among his chases. Since that time they have multiplied in many parts of the British empire; and England is now become more famous for its venison than any other country in the world. Whatever pains the French have taken to rival us in this particular, the flesh of their fallow deer, of which they keep but a few, has neither the fatness nor the flavour of that fed upon English pasture.

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[18] The fallow deer is known to bring forth from one to three at a time, and lives till about twenty. When these animals drink, they plunge their noses, like some horses, very deep under water, and continue in that situation for some time; but, to obviate any inconvenience, says that observing naturalist, the Rev. Mr. White, in his 'Natural History of Selborne,' they can open two vents, one at the inner corner of each eye, which has a communication with the nose. Here seems to be an extraordinary provision of nature worthy of our attention; for it appears as if these creatures would not be suffocated, though both their mouth and nostrils were stopped. This curious formation of the head may be of singular service to beasts of chase, by affording them free respiration: and no doubt these additional nostrils are thrown open when they are hard run. Mr. Pennant observed something analogous to this in the antelope. This animal has a long slit beneath each eye, which can be opened and shut at pleasure. On holding an orange to one, the creature made the same use of these orifices as of his nostrils; applying them to the fruit, and seeming to smell it through them.—Ed.

[19] A gamekeeper having shot at a deer, hit but did not kill him, for he had strength enough to fly into the heart of the forest, where the gamekeeper lost sight of him. Convinced that he had not missed his mark, and that the deer must sooner or later fall, he followed his track; but he had to traverse the forest for a long time before he saw any thing of the deer. At length he heard a distant groaning in a thicket; he quickened his pace, and discovered the wounded animal at some distance stretched upon the ground. He was just about to fire a second time, when he saw two other deer run up to him that was wounded. His curiosity being excited, he stopped to observe what they would do, without being himself seen by them. As soon as the wounded deer saw his friends, he altered his tones, and moaned in a louder and more impressive voice. The two others then began to lick his wounds, and as long as they licked the wounded deer was silent, for it seemed to afford him relief. The man then shot a second time at the deer, and hit him in the heart. The two others that had come to his assistance fled into the wood.—Ed.

[20] British Zoology.

However, there is scarcely a country in Europe, except far to the northward, in which this animal is a stranger. The Spanish fallow deer are as large as stags, but of a darker colour, and a more slender neck: their tails are longer than those of ours, they are black above, and white below. The Virginian deer are larger and stronger than ours, with great necks, and their colour inclinable to gray. Other kinds have the hoofs of their hind-legs marked outwardly with a white spot; and their ears and tail much longer than the common. One of these has been seen full of white spots, with a black list down the middle of his back. In Guiana, a country of South America, according to Labat, there are deer without horns, which are much less than those of Europe, but resembling them in every other particular. They are very lively, light of course, and excessively fearful; their hair is of a reddish sallow, their heads are small and lean, their ears little, their necks long and arched, the tail short, and the sight piercing. When pursued, they fly into places where no other animal can follow them. The negroes, who pursue them, stand to watch for them in narrow paths, which lead to the brook, or the meadow where they feed; there waiting in the utmost silence, for the slightest sound will drive them away, the negro, when he perceives the animal within reach, shoots, and is happy if he can bring down his game. Their flesh, though seldom fat, is considered as a great delicacy, and the hunter is well rewarded for his trouble.

THE ROE-BUCK.

The roe-buck is the smallest of the deer kind known in our climate, and is now almost extinct among us, except in some parts of the Highlands of Scotland. It is generally about three feet long, and about two feet high. The horns are from eight to nine inches long, upright, round, and divided into only three branches. The body is covered with very long hair, well-adapted to the rigour of its mountainous abode. The lower part of each hair is ash-colour; near the ends is a narrow bar of black, and the points are yellow. The hairs on the face are black, tipped with ash-colour. The ears are long, their insides of a pale yellow, and covered with long hair. The spaces bordering on the eyes and mouth are black. The chest, belly, and legs, and the inside of the thighs, are of a yellowish white; the rump is of a pure white, and the tail very short.[21] The make of this little animal is very elegant; and its swiftness equals its beauty. It differs from the fallow deer, in having round horns, and not flatted like theirs. It differs from the stag, in its smaller size, and the proportionable paucity of its antlers: and it differs from all of the goat kind, as it annually sheds its head, and obtains a new one, which none of that kind are ever seen to do.

As the stag frequents the thickest forests, and the sides of the highest mountains, the roe-buck, with humbler ambition, courts the shady thicket and the rising slope. Although less in size, and far inferior in strength to the stag, it is yet more beautiful, more active, and even more courageous. Its hair is always smooth, clean, and glossy; and it frequents only the driest places, and of the purest air. Though but a very little animal, as we have already observed, yet when its young is attacked, it faces even the stag himself, and often comes off victorious.[22] All its motions are elegant and easy; it bounds without effort, and continues the course with but little fatigue. It is also possessed of more cunning in avoiding the hunter, is more difficult to pursue; and, although its scent is much stronger than that of the stag, it is more frequently found to make good a retreat. It is not with the roe-buck as with the stag, who never offers to use art until his strength is beginning to decline; this more cunning animal, when it finds that its first efforts to escape are without success, returns upon its former track, again goes forward, and again returns, until by its various windings it has entirely confounded the scent, and joined the last emanations to those of its former course. It then by a bound goes to one side, lies flat on its belly, and permits the pack to pass by very near, without offering to stir.[23]

But the roe-buck differs not only from the stag in superior cunning, but also in its natural appetites, its inclinations, and its whole habits of living. Instead of herding together, these animals live in separate families; the sire, the dam, and the young ones, associate together, and never admit a stranger into their little community. All other of the deer kind are inconstant in their affection; but the roe-buck never leaves its mate;

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[21] There are two varieties of colour, one very red, and the other yellowish-brown-gray: there is even a third nearly black, in Hanover, but all have a white disk upon the buttocks.—Ed.

[22] Buffon, vol. xii. p. 75.

[23] Some years ago, a roe-buck, after being hunted out of Scotland, through Cumberland, and various parts of north England, at last took refuge in the woody recesses bordering upon the banks of the Tyne, between Prudhoe Castle and Wylam. It was repeatedly seen and hunted, but no dogs were equal to its speed. It frequently crossed the river; and, either by swiftness or artifice, eluded all its pursuers. It happened, during the rigour of a severe winter, that being pursued, it crossed the river upon the ice with some difficulty; and being much strained by its violent exertions, was taken alive. It was kept for some weeks in the house, and was then again turned out; but all its cunning and activity were gone; it seemed to have forgotten the places of its former retreat; and after running some time, it lay down in the middle of a brook, where it was killed by the dogs.—Ed.

and, as they have been generally bred up together from their first fawning, they conceive so strong an attachment, the male for the female, that they never after separate. Their rutting season continues but fifteen days; from the latter end of October to about the middle of November. They are not at that time, like the stag, overloaded with fat; they have not that strong odour, which is perceived in all others of the deer kind; they have none of those furious excesses; nothing, in short, that alters their state: they only drive away their fawns upon these occasions; the buck forcing them to retire, in order to make room for a succeeding progeny; however, when the copulating season is over, the fawns return to their does, and remain with them some time longer; after which, they quit them entirely, in order to begin an independent family of their own. The female goes with young but five months and a half, which alone serves to distinguish this animal from all others of the deer kind, that continue pregnant more than eight. In this respect, she rather approaches more nearly to the goat kind; from which, however, this race is separated by the male's annually casting its horns.

When the female is ready to bring forth, she seeks a retreat in the thickest part of the woods, being not less apprehensive of the buck, from whom she then separates, than of the wolf, the wild cat, and almost every ravenous animal of the forest; she generally produces two at a time, and three but very rarely. In about ten or twelve days these are able to follow the dam, except in cases of warm pursuit, when their strength is not equal to the fatigue. Upon such occasions, the tenderness of the dam is very extraordinary; leaving them in the deepest thicket, she offers herself to the danger, flies before the hounds, and does all in her power to lead them from the retreat where she has lodged her little ones. Such animals as are nearly upon her own level she boldly encounters; attacks the stag, the wild cat, and even the wolf; and while she has life, continues her efforts to protect her young. Yet all her endeavours are often vain. About the month of May, which is her fawning time, there is a greater destruction among those animals than at any other season of the year. Numbers of the fawns are taken alive by the peasants; numbers are found out, and worried by the dogs; and still more by the wolf, which has always been their most inveterate enemy. By these continual depredations upon this beautiful creature, the roe-buck is every day becoming scarcer; and the whole race in many countries is wholly worn out. They were once common in England; the huntsmen, who characterized only such beasts as they knew, have given names to the different kinds and ages, as to the stag: thus they called it the first year a *hind;* the second, a *gyrle;* and the third, a *hemuse;* but these names at present are utterly useless, since the animal no longer exists among us. Even in France, where it was once extremely common, it is now confined to a few provinces; and it is probable that in an age or two the whole breed will be utterly extirpated. Mr. Buffon, indeed, observes that in those districts where it is mostly found, it seems to maintain its usual plenty, and that the balance between its destruction and increase is held pretty even: however, the number in general is known to decrease; for wherever cultivation takes place, the beasts of nature are known to retire. Many animals that once flourished in the world may now be extinct; and the descriptions of Aristotle and Pliny, though taken from life, may be considered as fabulous, as their archetypes are no longer existing.

The fawns continue to follow the deer eight or nine months in all; and upon separating, their horns begin to appear simple, and without antlers, the first year, as in those of the stag kind.[24] These they shed at the latter end of autumn, and renew during the winter; differing in this from the stag, who sheds them in spring, and renews them in summer. When the roe-buck's head is completely furnished, it rubs the horns against the trees in the manner of the stag, and thus strips them of the rough skin and the blood-vessels, which no longer contribute to their nourishment and growth. When these fall, and new ones begin to appear, the roe-buck does not retire, as the stag, to the covert of the wood, but continues its usual haunts, only keeping down its head to avoid striking its horns against the branches of trees, the pain of which it seems to feel with exquisite sensibility. The stag, who sheds his horns in summer, is obliged to seek a retreat from the flies, that at that time greatly incommode him; but the roe-buck, who sheds them in winter, is under no such necessity; and, consequently, does not separate from its little family, but keeps with the female all the year round.[25]

As the growth of the roe-buck, and its arrival at maturity, is much speedier than that of the stag, so its life is proportionably shorter. It seldom is found to extend above twelve or fifteen years; and if kept tame, it does not live above six or seven. It is an animal of a very delicate constitution, requiring variety of food, air, and exercise. It must be paired with a female, and kept in a park of at least a hundred acres. They may easily be subdued, but never thoroughly tamed; no arts can teach them to be familiar with the feeder, much less attached to him. They still preserve a part of their natural wildness, and are subject to terrors without a cause. They sometimes, in attempting to escape, strike with such force against the walls of their enclosure that they break their limbs, and become utterly disabled. Whatever care is taken to tame them, they are never entirely to be relied on, as they have capricious fits of fierceness, and sometimes strike at those they dislike with a degree of force that is very dangerous.

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[24] Buffon, vol xii. p. 88.

[25] Ibid.

The cry of the roe-buck is neither so loud nor so frequent as that of the stag. The young ones have a particular manner of calling to the dam, which the hunters easily imitate, and often thus allure the female to her destruction. Upon some occasions, also, they become in a manner intoxicated with their food, which, during the spring, is said to ferment in their stomachs, and they are then very easily taken. In summer they keep close under covert of the forest, and seldom venture out, except in violent heats, to drink at some river or fountain. In general, however, they are contented to slake their thirst with the dew that falls on the grass and the leaves of trees, and seldom risk their safety to satisfy their appetite. They delight chiefly in hilly grounds, preferring the tender branches and buds of trees to corn or other vegetables; and it is universally allowed that the flesh of those between one and two years old is the greatest delicacy that is known. Perhaps, also, the scarceness of it enhances its flavour.

In America this animal is much more common than in Europe. With us there are but two known varieties; the red, which is the larger sort; and the brown, with a spot behind, which is less. But in the new continent the breed is extremely numerous, and the varieties in equal proportion. In Louisiana, where they are extremely common, they are much larger than in Europe, and the inhabitants live in a great measure upon its flesh, which tastes like mutton when well fatted. They are found also in Brazil, where they have the name of *cuguacu apara*, only differing from ours in some slight deviations in the horns. This animal is also said to be common in China; although such as have described it seem to confound it with the musk goat, which is of a quite different nature.

THE ELK.

We have hitherto been describing minute animals in comparison of the elk; the size of which, from concurrent testimony, appears to be equal to that of the elephant itself. It is an animal rather of the buck than the stag kind, as its horns are flatted towards the top; but it is far beyond both in stature, some of them being known to be above ten feet high. It is a native both of the old and new continent, being known in Europe under the name of the *elk*, and in America by that of the *moose-deer*. It is sometimes taken in the German and Russian forests, although seldom appearing; but it is extremely common in North America, where the natives pursue and track it in the snow. The accounts of this animal are extremely various; some describing it as being no higher than a horse, and others above twelve feet high.

As the stature of this creature makes its chief peculiarity, so it were to be wished that we could come to some precision upon that head. If we were to judge of its size by the horns, which are sometimes fortuitously dug up in many parts of Ireland, we should not be much amiss in ascribing them to an animal at least ten feet high. One of these I have seen, which was ten feet nine inches from one tip to the other. From such dimensions, it is easy to perceive that it required an animal far beyond the size of a horse to support them. To bear a head with such extensive and heavy antlers, required no small degree of strength; and without all doubt the bulk of the body must have been proportionable to the size of the horns. I remember some years ago to have seen a small moose-deer, which was brought from America by a gentleman of Ireland; it was about the size of a horse, and the horns were very little larger than those of a common stag: this, therefore, serves to prove that the horns bear an exact proportion to the animal's size; the small elk has but small horns; whereas those enormous ones, which we have described above, must have belonged to a proportionable creature. In all the more noble animals, Nature observes a perfect symmetry; and it is not to be supposed she fails in this single instance. We have no reason, therefore, to doubt the accounts of Jocelyn and Dudley, who affirm that they have been found fourteen spans; which, at nine inches to a span, makes the animal almost eleven feet high. Others have extended their accounts to twelve and fourteen feet, which makes this creature one of the most formidable of the forest.

There is but very little difference between the European elk and the American moose-deer, as they are but varieties of the same animal. It may be rather larger in America than with us; as in the forests of that unpeopled country it receives less disturbance than in our own. In all places, however, it is timorous and gentle; content with its pasture, and never willing to disturb any other animal, when supplied itself.

The European elk grows to above seven or eight feet high. In the year 1742, there was a female of this animal shown at Paris, which was caught in a forest of Red Russia, belonging to the Cham of Tartary;[26] it was then but young, and its height was even at that time six feet seven inches; but the describer observes, that it has since become much taller and thicker, so that we may suppose this female at least seven feet high. There have been no late opportunities of seeing the male; but, by the rule of proportion, we may estimate his size at eight or nine feet, at the least, which is about twice as high as an ordinary horse. The height, however, of the female which was measured, was but six feet seven inches, Paris measure: or almost seven English feet high. It was ten feet from the tip of the nose to the insertion of the tail; and eight feet round the body. The hair was very long and coarse, like that of a wild boar. The ears resembled those of a mule, and were a foot and a half long. The upper jaw was longer by six inches than the lower; and, like other ruminating animals, it had no teeth (cutting-teeth, I suppose the describer means). It has a large beard under the throat, like a goat; and in the middle of the forehead, between the horns, there was a bone as large as an egg. The nostrils were four inches long on each side of the mouth. It made use of its fore-feet as a defence against its enemies. Those who showed it, asserted that it ran with astonishing swiftness; and that it swam also with equal expedition, and was very fond of the water. They gave it thirty pounds of bread every day, besides hay, and it drank eight buckets of water. It was tame and familiar, and submissive enough to its keeper.

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[26] Dictionnaire Raisonnée des Animaux. As [illegible] Elan.

This description differs in many circumstances from that which we have of the moose, or American elk, which the French call the original. Of these there are two kinds, the common light gray moose, which is not very large; and the black moose, which grows to an enormous height. Mr. Dudley observes, that a doe or hind of the black moose kind, of the fourth year, wanted but an inch of seven feet high. All, however, of both kinds, have flat palmed horns, not unlike the fallow deer, only that the palm is much larger, having a short trunk at the head, and then immediately spreading above a foot broad, with a kind of small antlers, like teeth, on one of the edges. In this particular, all of the elk kind agree; as well the European elk, as the gray and the black moose-deer.

The gray moose-deer is about the size of a horse; and although it has large buttocks, its tail is not above an inch long. As in all of this kind the upper lip is much longer than the under, it is said that they continue to go backward as they feed. Their nostrils are so large that a man may thrust his hand in a considerable way; and their horns are as long as those of a stag, but, as was observed, much broader.

The black moose is the enormous animal mentioned above, from eight to twelve feet high. Jocelyn, who is the first English writer that mentions it, says, that it is a goodly creature twelve feet high, with exceeding fair horns, that have broad palms, two fathoms from the top of one horn to another. He assures us, that it is a creature or rather a monster of superfluity and many times bigger than an English ox. This account is confirmed by Dudley; but he does not give so great an expansion to the horns, measuring them only thirty-one inches between one tip and the other: however, that such an extraordinary animal as Jocelyn describes, has actually existed we can make no manner of doubt of, since there are horns common enough to be seen among us, twelve feet from one tip to the other.

These animals delight in cold countries, feeding upon grass in summer, and the bark of trees in winter. When the whole country is deeply covered with snow, the moose-deer herd together under the tall pine trees, strip off the bark, and remain in that part of the forest while it yields them subsistence. It is at that time that the natives prepare to hunt them; and particularly when the sun begins to melt the snow by day, which is frozen again at night; for then the icy crust which covers the surface of the snow, is too weak to support so great a bulk, and only retards the animal's motion. When the Indians therefore perceive a herd of these at a distance, they immediately prepare for their pursuit, which is not, as with us, the sport of an hour, but is attended with toil, difficulty, and danger.[27] The timorous animal no sooner observes its enemies approach, than it immediately endeavours to escape, but sinks at every step it takes. Still, however, it pursues its way through a thousand obstacles: the snow, which is usually four feet deep, yields to its weight, and embarrasses its speed; the sharp ice wounds its feet; and its lofty horns are entangled in the branches of the forest, as it passes along. The trees, however, are broken down with ease; and wherever the moose-deer runs, it is perceived by the snapping off the branches of the trees, as thick as a man's thigh, with its horns. The chase lasts in this manner for the whole day; and sometimes it has been known to continue for two, nay, three days together; for the pursuers are often not less excited by famine, than the pursued by fear. Their perseverance, however, generally succeeds; and the Indian who first comes near enough darts his lance with unerring aim, which sticks in the poor animal, and at first increases its efforts to escape. In this manner the moose trots heavily on, (for that is its usual pace,) till its pursuers once more come up, and repeat their blow: upon this, it again summons up sufficient vigour to get a-head; but at last, quite tired, and spent with loss of blood, it sinks, as the describer expresses it, like a ruined building, and makes the earth shake beneath its fall.

This animal, when killed, is a very valuable acquisition to the hunters. The flesh is very well tasted, and said to be very nourishing. The hide is strong, and so thick that it has been often known to turn a musket-ball; however, it is soft and pliable, and, when tanned, the leather is extremely light, yet very lasting. The fur is a light gray in some, and blackish in others; and when viewed through a microscope, appears spongy like a bulrush, and is smaller at the roots and points than in the middle; for this reason, it lies very flat and smooth, and though beaten or abused never so much, it always returns to its former state. The horns also are not less useful, being applied to all the purposes for which hartshorn is beneficial: these are different in different animals; in some they resemble entirely those of the European elk, which spread into a broad palm, with small antlers on one of the edges; in others they have a branched brow-antler between the bur and the palm, which the German elk has not; and in this they entirely agree with those whose horns are so frequently dug up in Ireland. This animal is found to be troubled with the epilepsy, as it is often found to fall down when pursued, and thus becomes an easier prey; for this reason an imaginary virtue has been ascribed to the hinder hoof, which some have supposed to be a specific against all epileptic disorders. This, however, may be considered as a vulgar error; as well as that of its curing itself of this disorder by applying the hinder hoof behind the ear. After all, this animal is but very indifferently and confusedly described by travellers; each mixing his account with something false or trivial; often mistaking some other quadruped for the elk, and confounding its history.[28] Thus some have mistaken it for the rein-deer, which, in every thing but size, it greatly resembles; some have supposed it to be the same with the Tapurette,[29] from which it entirely differs; some have described it as the common red American stag, which scarcely differs from our own; and, lastly, some have confounded it with the Bubalus, which is more properly a gazelle of Africa.[30]

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[27] Phil. Trans. vol. ii. p. 436.

THE REIN-DEER.

OF all animals of the deer kind, the rein-deer is the most extraordinary and the most useful. It is a native of the icy regions of the north: and though many attempts have been made to accustom it to a more southern climate, it shortly feels the influence of the change, and in a few months declines and dies. Nature seems to have fitted it entirely to answer the necessities of that hardy race of mankind that live near the pole. As these would find it impossible to subsist among their barren snowy mountains without its aid, so this animal can live only there, where its assistance is most absolutely necessary. From it alone the natives of Lapland and Greenland supply most of their wants; it answers the purposes of a horse, to convey them and their scanty furniture from one mountain to another; it answers the purposes of a cow in giving milk; and it answers the purposes of the sheep, in furnishing them with a warm though a homely kind of clothing. From this quadruped alone, therefore, they receive as many advantages as we derive from three of our most useful creatures; so that Providence does not leave these poor outcasts entirely destitute, but gives them a faithful domestic, more patient and serviceable than any other in nature.

The rein-deer resembles the American elk in the fashion of its horns. It is not easy in words to describe these minute differences; nor will the reader, perhaps, have a distinct idea of the similitude, when told that both have brow-antlers, very large, and hanging over their eyes, palmated towards the top, and bending forward like a bow.[31] But here the similitude between these two animals ends; for as the elk is much larger than the stag, so the rein-deer is much smaller. It is lower and stronger built than the stag; its legs are shorter and thicker, and its hoofs much broader than in that animal; its hair is much thicker and warmer; its horns much larger in proportion, and branching forward over its eyes; its ears are much larger; its pace is rather a trot than a bounding, and this it can continue for a whole day; its hoofs are cloven and moveable, so that it spreads them abroad as it goes, to prevent its sinking in the snow. When it proceeds on a journey, it lays its great horns on its back, while there are two branches which always hang over its forehead, and almost cover its face. One thing seems peculiar to this animal and the elk, which is, that as they move along their hoofs are heard to crack with a pretty loud noise. This arises from their manner of treading; for as they rest upon their cloven hoof, it spreads on the ground and the two divisions separate from each other, but when they lift it, the divisions close again, and strike against each other with a crack. The female also of the rein deer has horns as well as the male; by which the species is distinguished from all other animals of the deer kind whatsoever.

When the rein-deer first shed their coat of hair, they are brown; but in proportion as summer approaches, their hair begins to grow whitish, until, at last, they are nearly gray.[32] They are, however, always black about the eyes. The neck has long hair hanging down, and coarser than upon any other part of the body. The feet, just at the insertion of the hoof, are surrounded with a ring of white. The hair in general stands so thick over the whole body, that if one should attempt to separate it, the skin will nowhere appear uncovered: whenever it falls also, it is not seen to drop from the root, as in other quadrupeds, but seems broken short near the bottom; so that the lower part of the hair is seen growing, while the upper falls away. The horns of the female are made like those of the male, except that they are smaller and less branching. As in the rest of the deer kind, they sprout from the points; and also in the beginning are furnished with a hairy crust, which supports the blood-vessels of most exquisite sensibility. The rein-deer shed their horns, after rutting-time, at the latter end of November; and they are not completely furnished again till towards autumn. The female always retains hers till she brings forth, and then sheds them about the beginning of November. If she be barren, however, which is not unfrequently the case, she does not shed them till winter. The castration of the rein-deer does not prevent the shedding of their horns: those which are the strongest cast them early in winter; those which are more weakly, not so soon. Thus, from all these circumstances, we see how greatly this animal differs from the common stag. The female of the rein-deer has horns, which the hind is never seen to have; the rein-deer, when castrated, renews its horns, which we are assured the stag never does: it differs not less in its habits and manner of living, being tame, submissive, and patient; while the stag is wild, capricious, and unmanageable.

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[28] See Supplementary Note B, p. 347.

[29] Condamine.

[30] Dapper, description de l'Afrique, p. 17.

[31] In the elk the horns are stemless, or branched from the base; in the rein-deer the horns are round, bent back, and palmated at the extremities. In length they are generally two feet eight inches, and from tip to tip two feet five; they weigh nine pounds; the projecting brow-antler is fourteen inches long, one foot broad, and serrated at the end. It should seem, both from its situation and form, an excellent instrument to remove the snow, under which their favourite moss lies.—ED.

[32] For the greatest part of this description of the rein-deer, I am obliged to Mr. Hoffberg; upon whose authority, being a native of Sweden, and an experienced naturalist, we may confidently rely.

The rein-deer, as was said, is naturally an inhabitant of the countries bordering on the arctic circle.[33] It is not unknown to the natives of Siberia. The North Americans also hunt it under the name of the *caribou*. But in Lapland, this animal is converted to the utmost advantage; and some herdsmen of that country are known to possess above a thousand in a single herd.

Lapland is divided into two districts, the mountainous and the woody. The mountainous part of the country is at best barren and bleak, excessively cold, and uninhabitable during the winter; still, however, it is the most desirable part of this frightful region, and is most thickly peopled during the summer. The natives generally reside on the declivity of the mountains, three or four cottages together, and lead a cheerful and a social life. Upon the approach of winter, they are obliged to migrate into the plains below, each bringing down his whole herd, which often amounts to more than a thousand, and leading them where the pasture is in greatest plenty. The woody part of the country is much more desolate and hideous. The whole face of nature there presents a frightful scene of trees without fruit, and plains without verdure. As far as the eye can reach, nothing is to be seen, even in the midst of summer, but barren fields, covered only with a moss, almost as white as snow; no grass, no flowery landscapes, only here and there a pine-tree, which may have escaped the frequent conflagrations by which the natives burn down their forests. But what is very extraordinary, as the whole surface of the country is clothed in white, so, on the contrary, the forests seem to the last degree dark and gloomy. While one kind of moss makes the fields look as if they were covered with snow, another kind blackens over all their trees, and even hides their verdure. This moss, however, which deforms the country, serves for its only support, as upon it alone the rein-deer can subsist.[34] The inhabitants, who, during the summer, lived among the mountains, drive down their herds in winter, and people the plains and woods below. Such of the Laplanders as inhabit the woods and the plains all the year round, live remote from each other, and, having been used to solitude, are melancholy, ignorant, and helpless. They are much poorer also than the mountaineers; for, while one of those is found to possess a thousand rein-deer at a time, none of these are ever known to rear the tenth part of that number. The rein-deer makes the riches of this people; and the cold mountainous parts of the country agree best with its constitution. It is for this reason, therefore, that the mountains of Lapland are preferred to the woods; and that many claim an exclusive right to the tops of hills, covered in almost eternal snow. As soon as the summer begins to appear, the Laplander, who had fed his rein-deer upon the lower grounds during the winter, then drives them up to the mountains, and leaves the woody country, and the low pasture, which at that season are truly deplorable. The gnats bred by the sun's heat in the marshy bottoms and the weedy lakes, with which the country abounds more than any other part of the world, are all upon the wing, and fill the whole air like clouds of dust in a dry windy day. The inhabitants, at that time, are obliged to daub their faces with pitch, mixed with milk, to shield their skins from their depredations. All places are then so greatly infested, that the poor natives can scarcely open their mouths without fear of suffocation; the insects enter, from their numbers and minuteness, into the nostrils and the eyes, and do not leave the sufferer a moment at his ease. But they are chiefly enemies to the rein-deer; the horns of that animal being then in their tender state, and possessed of extreme sensibility, a famished cloud of insects instantly settle upon them, and drive the poor animal almost to distraction. In this extremity, there are but two remedies to which the quadruped, as well as its master, are obliged to have recourse. The one is, for both to take shelter near their cottage, where a large fire of tree-moss is prepared, which filling the whole place with smoke, keeps off the gnats, and thus by one inconvenience expels a greater; the other is, to ascend to the highest summit of the mountains, where the air is too thin, and the weather too cold, for the gnats to come. There the rein-deer are seen to continue the whole day, although without food, rather than to venture down into the lower parts, where they can have no defence against their unceasing persecutors. Besides the gnat, there is also a gadfly, that, during the summer season, is no less formidable to them. This insect is bred under their skins, where the egg has been deposited the preceding summer; and it is no sooner produced as a fly, than it again endeavours to deposit its eggs in some place similar to that from whence it came. Whenever, therefore, it appears flying over a herd of rein-deer, it puts the whole body, how numerous soever, into motion; they know their enemy, and do all they can, by tossing their horns, and running among each other, to terrify or avoid it. All their endeavours, however, are too generally without effect; the gadfly is seen to deposit its eggs, which burrowing under the skin, wound it in several places, and often bring on an incurable disorder. In the morning, therefore, as soon as the Lapland herdsman drives his deer to pasture, his greatest care is to keep them from scaling the summits of the mountains where there is no food, but where they go merely to be at ease from the gnats and gadflies that are ever annoying them. At this time there is a strong contest between the dogs and the deer; the one endeavouring to climb up against the side of the hill, and to gain those summits that are covered in eternal snows; and the other forcing them down, by barking and threatening, and, in a manner, compelling them into the places where there food is in the greatest quantity. There the men and dogs confine them; guarding them with the utmost precaution the whole day, and driving them home at the proper season for milking.

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[33] An attempt was made about seven years ago to introduce the rein-deer upon an extensive scale, in the colder parts of England and Scotland. Many persons will remember Mr. Bullock's exhibition of rein-deers and a Lapland family. Out of two hundred deer, which were brought by him from Norway, nearly every one died. Those that were turned out upon the Pentland-hills, near Edinburgh—a situation which was considered peculiarly favourable—all died. A few appeared to do well in a park near Dublin; but we are unable to say if they are still alive. The Duke of Athol had previously placed a herd of rein-deer in the mountains of his estate, but the experiment failed in a similar way. This circumstance is not to be attributed to the want of proper food—for the rein-deer moss is found abundantly in Scotland. It grows, too, in many parts of England, particularly on Bagshot-heath. But the same ill success has attended the introduction of the larger species of deer, which belong to the new Continent. Several fine species of the Wapiti—an American deer—were turned into Windsor Park a few years ago; none of them lived more than a year. Whether these trials have failed through a want of proper attention to the peculiar habits of the animal, or that they naturally result from the tenacity with which the deer tribe adhere to their original geographical position, as a law of nature—is a question not easy to be decided.—Ed.

[34] The rein-deer feeds also on frogs, snakes, and even on the mountain-rat (the *mus lemmus* of Linn.), often pursuing the latter to such a great distance, as not to be able to find its way home again.—Ed.

The female brings forth in the middle of May, and gives milk till about the middle of October. Every morning and evening, during the summer, the herdsman returns to the cottage with his deer to be milked, where the women previously have kindled up a smoky fire, which effectually drives off the gnats, and keeps the rein-deer quiet while milking. The female furnishes about a pint, which, though thinner than that of the cow, is, nevertheless, sweeter and more nourishing. This done, the herdsman drives them back to pasture; as he neither folds nor houses them, neither provides for their subsistence during the winter, nor improves their pasture by cultivation.

Upon the return of the winter, when the gnats and flies are no longer to be feared, the Laplander descends into the lower grounds; and as there are but few to dispute the possession of that desolate country, he has an extensive range to feed them in. Their chief, and almost their only food at that time, is the white moss already mentioned; which, from its being fed upon by this animal, obtains the name of the *lichen rangiferinus*, This is of two kinds; the woody lichen, which covers almost all the desert parts of the country like snow; the other is black, and covers the branches of the trees in very great quantities. However unpleasing these may be to the spectator, the native esteems them as one of his choicest benefits, and the most indulgent gift of nature. While his fields are clothed with moss, he envies neither the fertility nor the verdure of the more southern landscape; dressed up warmly in his deer-skin clothes, with shoes and gloves of the same materials, he drives his herds along the desert, fearless and at ease, ignorant of any higher luxury than what their milk and smoke-dried flesh afford him. Hardened to the climate, he sleeps in the midst of ice; or awaking, doses away his time with tobacco; while his faithful dogs supply his place, and keep the herd from wandering. The deer, in the meantime, with instincts adapted to the soil, pursue their food, though covered in the deepest snow. They turn it up with their noses, like swine; and even though its surface be frozen and stiff, yet the hide is so hardened in that part, that they easily overcome the difficulty. It sometimes however happens, though but rarely, that the winter commences with rain, and a frost ensuing, covers the whole country with a glazed crust of ice. Then, indeed, both the rein-deer and Laplander are undone; they have no provisions laid up in case of accident, and the only resource is to cut down the large-pine trees that are covered with moss, which furnishes but a scanty supply; so that the greatest part of the herd is then seen to perish without a possibility of assistance. It sometimes also happens, that even this supply is wanting; for the Laplander often burns down his woods, in order to improve and fertilize the soil which produces the moss upon which he feeds his cattle.

In this manner, the pastoral life is still continued near the pole; neither the coldness of the winter nor the length of the nights, neither the wildness of the forest nor the vagrant disposition of the herd, interrupt the even tenor of the Laplander's life. By night and day he is seen attending his favourite cattle, and remains unaffected, in a season which would be speedy death to those bred up in a milder climate. He gives himself no uneasiness to house his herds, or to provide a winter subsistence for them; he is at the trouble neither of manuring his grounds, nor bringing in his harvests; he is not the hireling of another's luxury; all his labours are to obviate the necessities of his own situation; and these he undergoes with cheerfulness, as he is sure to enjoy the fruits of his own industry. If, therefore, we compare the Laplander with the peasant of more southern climates, we shall have little reason to pity his situation; the climate in which he lives is rather terrible to us than to him; and as for the rest, he is blessed with liberty, plenty, and ease. The rein-deer alone supplies him with all the wants of life, and some of the conveniences; serving to show how many advantages nature is capable of supplying, when necessity gives the call. Thus the poor little helpless native, who was originally, perhaps, driven by fear or famine into those inhospitable climates, would seem, at first view, to be the most wretched of mankind: but it is far otherwise; he looks round among the few wild animals that his barren country can maintain, and singles out one from among them, and that of a kind which the rest of mankind have not thought worth taking from a state of nature; this he cultivates, propagates, and multiplies; and from this alone derives every comfort that can soften the severity of his situation.

The rein-deer of this country are of two kinds, the wild and the tame. The wild are larger and stronger, but more mischievous than the others. Their breed, however, is preferred to that of the tame; and the female of the latter is often sent into the woods, from whence she returns home impregnated by one of the wild kind. These are fitter for drawing the sledge, to which the Laplander accustoms them betimes, and yokes them to it by a strap, which goes round the neck, and comes down between their legs. The sledge is extremely light, and shod at the bottom with the skin of a young deer, the hair turned to slide on the frozen snow. The person who sits on this guides the animal with a cord, fastened round the horns, and encourages it to proceed with his voice, and drives it with a goad. Some of the wild breed, though by far the strongest, are yet found refractory, and often turn upon their drivers; who have then no other resource but to cover themselves with their sledge, and let the animal vent its fury upon that. But it is otherwise with those that are tame; no creature can be more active, patient, and willing; when hard pushed, they will trot nine or ten Swedish miles, or between fifty and sixty English miles, at one stretch.[35] But, in such a case the poor obedient creature fatigues himself to death, and, if not prevented by the Laplander, who kills it immediately, will die in a day or two after. In general, they can go about thirty miles without halting, and this without any great or dangerous efforts. This, which is the only way of travelling in that country, can be performed only in winter, when the snow is glazed over with ice; and although it be a very speedy method of conveyance, yet it is inconvenient, dangerous, and troublesome.

In order to make these animals more obedient, and more generally serviceable, they castrate them; which operation the Laplanders perform with their teeth; these become sooner fat when taken from labour; and they are found to be stronger in drawing the sledge. There is usually one male left entire for every six females; these are in rut from the feast of St. Matthew to about Michaelmas. At this time their horns are thoroughly burnished, and their battles among each other are fierce and obstinate. The females do not begin to breed till they are two years old; and then they continue regularly breeding every year till they are superannuated. They go with young above eight months, and generally bring forth two at a time. The fondness of the dam for her young is very remarkable; it often happens that when they are separated from her, she will return from pasture, keep calling round the cottage for them, and will not desist until, dead or alive, they are brought and laid at her feet. They are at first of a light brown; but they become darker with age; and at last the old ones are of a brown, almost approaching to blackness. The young follow the dam for two or three years; but they do not acquire their full growth until four. They are then broke in, and managed for drawing the sledge; and they continue serviceable for four or five years longer. They never live above fifteen or sixteen years; and when they arrive at the proper age, the Laplander generally kills them for the sake of their skins and their flesh. This he performs by striking them on the back of the neck with his knife into the spinal marrow; upon which they instantly fall, and he then cuts the arteries that lead to the heart, and lets the blood discharge itself into the cavity of the breast.

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[35] There is a portrait of a rein-deer in the palace of Drotningholm (Sweden), which he represented, upon an occasion of emergency, to have drawn an officer with important despatches the incredible distance of eight hundred English miles in forty-eight hours. This event is stated to have happened in 1699, and the tradition adds, that the deer dropped down lifeless upon his arrival. Pictet, a French astronomer, who visited the northern parts of Lapland in 1769, for the purpose of observing the transit of Venus, was anxious to know the speed of the rein-deer; and therefore started three rein-deer in light sledges, for a certain short distance, which he accurately measured. The following was the result:—"The first deer performed 3,089 feet, 9 inches, in two minutes, being at the rate of nearly 19 English miles in an hour, and thus accomplishing 25 feet, 9 inches, in every second. The second did the same in three minutes; and the third and last deer, in three minutes and twenty-six seconds. The ground in this race was nearly level."

There is scarcely any part of this animal that is not converted to its peculiar uses. As soon as it begins to grow old, and some time before the rut, it is killed, and the flesh dried in the air. It is also sometimes hardened with smoke, and laid up for travelling provision, when the natives migrate from one part of the country to another. During the winter, the rein-deer are slaughtered as sheep with us; and every four persons in the family are allowed one rein-deer for their week's subsistence. In spring, they spare the herd as much as they can, and live upon fresh fish. In summer, the milk and curd of the rein-deer make their chief provision; and, in autumn, they live wholly upon fowls, which they kill with a cross-bow, or catch in springs. Nor is this so scanty an allowance; since, at that time, the sea-fowls come in such abundance that their ponds and springs are covered over. These are not so shy as with us, but yield themselves an easy prey. They are chiefly allured to those places by the swarms of gnats which infest the country during summer, and now repay the former inconveniences, by inviting such numbers of birds as supply the natives with food a fourth part of the year, in great abundance.

The milk, when newly taken, is warmed in a cauldron, and thickened with rennet; and then the curd is pressed into cheeses, which are little and well tasted. These are never found to breed mites as the cheese of other countries; probably because the mite-fly is not to be found in Lapland. The whey which remains is warmed up again, and becomes of a consistence as if thickened with the white of eggs. Upon this the Laplanders feed during the summer; it is pleasant and well tasted but not very nourishing. As to butter, they very seldom make any, because the milk affords but a very small quantity, and this, both in taste and consistence, is more nearly resembling to suet. They never keep their milk till it turns sour; and do not dress it into the variety of dishes which the more southern countries are known to do. The only delicacy they make from it is with wood-sorrel, which being boiled up with it, and coagulating, the whole is put into casks, or deer-skins, and kept under ground to be eaten in winter.

The skin is even a more valuable part of this animal than either of the former. From that part of it which covered the head and feet, they make their strong snow-shoes, with the hair on the outside. Of the other parts they compose their garments, which are extremely warm, and which cover them all over. The hair of these also is on the outside; and they sometimes line them also with the fur of the glutton, or some other warm-furred animal of that climate. These skins also serve them for beds. They spread them on each side of the fire, upon some leaves of the dwarf birch-tree, and in this manner lie both soft and warm. Many garments made of the skin of the rein-deer are sold every year to the inhabitants of the more southern parts of Europe; and they are found so serviceable in keeping out the cold, that even people of the first rank are known to wear them.

In short, no part of this animal is thrown away as useless. The blood is preserved in small casks, to make sauce with the marrow in spring. The horns are sold to be converted into glue. The sinews are dried, and divided so as to make the strongest kind of sewing thread, not unlike catgut. The tongues, which are considered as a great delicacy, are dried, and sold into the more southern provinces. The intestines themselves are washed like our tripe, and in high esteem among the natives. Thus the Laplander finds all his necessities amply supplied from this single animal; and he who has a large herd of these animals has no idea of higher luxury.[37]

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[37] The movements of the wandering Laplander are determined by those of his deer. As camels constitute the chief possession of an Arab, so do the rein-deer comprise all the wealth of a Laplander. The number of deer belonging to a herd is from three hundred to five hundred; with these a Laplander can do well, and live in tolerable comfort. He can make in summer a sufficient quantity of cheese for the year's consumption; and, during the winter season, can afford to kill deer enough to supply him and his family pretty constantly with venison. With two hundred deer, a man, if his family be but small, can manage to get on. If he have but one hundred, his subsistence is very precarious, and he cannot rely entirely upon them for support. Should he have but fifty, he is no longer independent, or able to keep a separate establishment, but generally joins his small herd to that of some richer Laplander, being then considered more in the light of a menial, undertaking the laborious office of attending upon and watching the herd, bringing them home to be milked, and other similar offices, in return for the subsistence afforded him. With this stock the Laplander wanders through the greatest variety of wild and beautiful scenery; but he is little sensible to the impressions which such regions produce upon the mind of an intelligent traveller. The extremes of bodily fatigue and want leave little room for the cultivation of the mind; and the love of the sublime and beautiful of nature belongs to an advanced state of the intellect. These rich summer scenes of Lapland are wonderfully enlivened by the presence of the wanderer and his herds. Von Buch, a celebrated traveller, has well described the evening milking-time:—"It is a new and a pleasing spectacle, to see in the evening the herd assembled round the gamme (encampment) to be milked. On all the hills around, every thing is in an instant full of life and motion The busy dogs are everywhere barking, and bringing the mass nearer and nearer, and the rein-deer bound and run, stand still, and bound again, in an indescribable variety of movements. When the feeding animal, frightened by the dog, raises his head, and displays aloft his large and proud antlers, what a beautiful and majestic sight! And when he courses over the ground, how fleet and light are his speed and carriage! We never hear the foot on the earth, and nothing but the incessant crackling of the knee-

But although the rein-deer be a very hardy and vigorous animal, it is not without its diseases. I have already mentioned the pain it feels from the gnat, and the apprehensions it is under from the gadfly. Its hide is often found pierced in a hundred places, like a sieve, from this insect, and not a few die in their third year from this very cause. Their teats also are subject to cracking, so that blood comes instead of milk. They sometimes take a loathing for their food; and, instead of eating, stand still, and chew the cud. They are also troubled with a vertigo, like the elk, and turn round often till they die. The Laplander judges of their state by the manner of their turning. If they turn to the right, he judges their disorder but slight; if they turn to the left, he deems it incurable. The rein-deer are also subject to ulcers near the hoof, which unqualifies them for travelling, or keeping with the herd. But the most fatal disorder of all is, that which the natives call the *suddataka*, which attacks this animal at all seasons of the year. The instant it is seized with this disease, it begins to breathe with greater difficulty; its eyes begin to stare, and its nostrils to expand. It acquires also an unusual degree of ferocity, and attacks all it meets indiscriminately. Still, however, it continues to feed as if in health, but it is not seen to chew the cud, and it lies down more frequently than before. In this manner it continues, every day consuming and growing more lean, till at last it dies from mere inanition; and not one of those that are attacked with this disorder are ever found to recover. Notwithstanding, it is but very lately known in that part of the world; although, during the last ten or fifteen years, it has spoiled whole provinces of this necessary creature. It is contagious; and the moment the Laplander perceives any of his herd infected, he hastens to kill them immediately, before it spreads any farther. When examined internally, there is a frothy substance found in the brain, and round the lungs; the intestines are lax and flabby, and the spleen is diminished almost to nothing. The Laplander's only cure in all these disorders is, to anoint the animal's back with tar; if this does not succeed, he considers the disease as beyond the power of art; and, with his natural phlegm, submits to the severities of fortune.

Besides the internal maladies of this animal, there are some external enemies which it has to fear. The bears now and then make depredations upon the herd; but of all their persecutors, the creature called the *glutton* is the most dangerous and the most successful. The war between these is carried on not less in Lapland than in North America, where the rein-deer is called the *caribou*, and the *glutton* the *carajou*. This animal, which is not above the size of a badger, waits whole weeks together for its prey, hid in the branches of some spreading tree; and when the wild rein-deer passes underneath, it instantly drops down upon it, fixing its teeth and claws into the neck, just behind the horns. It is in vain that the wounded animal then flies for protection, that it rustles among the branches of the forest, the glutton still holds its former position; and, although it often loses a part of its skin and flesh, which are rubbed off against the trees, yet it still keeps fast until its prey drops with fatigue and loss of blood. The deer has but one only method of escape, which is by jumping into the water; that element its enemy cannot endure; for, as we are told, it quits its hold immediately and then thinks only of providing for its own proper security.

joints, as if produced by a repetition of electric shocks—a singular noise; and from the number of rein-deer by whom it is at once produced, it is heard at a great distance. When all the herd, consisting of three or four hundred, at last reach the gamme, they stand still, or repose themselves, or frisk about in confidence, play with their antlers against each other, or in groupes surround a patch of moss browsing. When the maidens run about with their milk-vessels from deer to deer, the brother or servant throws a bark halter round the antlers of the animal which they point out to him, and draws it towards them; the animal generally struggles, and is unwilling to follow the halter, and the maiden laughs at and enjoys the labour it occasions, and sometimes wantonly allows it to get loose that it may again be caught for her; while the father and mother are heard scolding them for their frolicsome behaviour, which has often the effect of scaring the whole flock. Who, viewing this scene, would not think on Laban, on Leah, Rachel, and Jacob? When the herd at last stretches itself, to the number of so many hundreds at once, about the gamme, we imagine we are beholding an entire encampment, and the commanding mind which presides over the whole stationed in the middle." The noise which the traveller describes as "the crackling of his knee-joints," is produced by the contraction of the rein-deer's hoofs, when the foot is raised from the ground. These hoofs are not narrow and pointed, like those of the fallow deer, which finds its food upon unyielding surfaces; but they are broad and spreading; and thus, when the rein-deer crosses the yielding snows, the foot presents a large surface, and, like the snow-shoe of the Norwegians and Canadian Indians, prevents, to a certain extent, the animal sinking as deeply as it would if the hoof were small and compact.—ED.

NOTE A.—*Deer-hunting in Britain.*

The great huntings of Scotland and of the border countries are well known to all the readers of our minstrelsy. The "woful hunting" of Chevy Chase has been, perhaps, one of the most popular poems of any language. This union of the chase and of war was a natural alliance; for, amongst a rude people, personal prowess in the one was the quality which most commanded success in the other. Gaston de Foix, occasionally one of the most triumphant, because one of the most cruel, treacherous, and altogether abominable heroes of the days of chivalry, was the mightiest hunter of his day. He is said to have kept sixteen hundred hounds; and he wrote a book on hunting, extremely accurate and curious in its details. All sovereigns, however, did not pursue the chase with the ardour of Gaston-Phœbus, duke of Foix, nor of James V. of Scotland. The Scottish kings used to shoot the deer from an elevated seat as the packs were driven before them—a practice demanding as much enterprise, and altogether as rational, as what in the terms of modern sporting, is called *the battue*. Pennant, however, in his History of Scotland, has described a scene of more danger; and he has translated a passage from an old author, which illustrates in a graphic way the ancient modes of hunting: "One of the walks retains the name of the King's seat, having been the place where the Scottish monarchs placed themselves in order to direct their shafts with advantage at the flying deer, driven that way for their amusement. A chase of this kind had very nearly prevented the future miseries of the unhappy Mary Stuart. The story is told by William Barclay in his treatise *Contra Monarchomachos:* it gives a lively picture of the ancient manner of hunting, and, on that account, will perhaps be acceptable to the reader in an English dress.

"In the year 1563, the Earl of Athole, a prince of the blood royal, had, with much trouble, and vast expense, a hunting match for the entertainment of our most illustrious and most gracious queen. Our people called this a royal hunting. I was then a young man, and was present on that occasion. Two thousand Highlanders, or wild Scotch, as you call them here, were employed to drive to the hunting ground all the deer from the woods and hills of Athole, Badenoch, Mar, Murray, and the counties about. As these Highlanders use a light dress, and are very swift of foot, they went up and down so nimbly, that, in less than two months' time, they brought together two thousand red deer, besides roes and fallow deer. The queen, the great men, and a number of others were in a glen when all these deer were brought before them. Believe me, the whole body moved forward in something like battle-order. This sight still strikes me, and ever will strike me, for they had a leader whom they followed close wherever he moved. This leader was a very fine stag, with a very high head. This sight delighted the queen very much; but she soon had cause for fear, upon the earl's (who had been from his early days accustomed to such sights) addressing her thus: 'Do you observe that stag who is foremost of the herd? there is danger from that stag; for if either fear or rage should force him from the ridge of that hill, let every one look to himself, for none of us will be out of the way of harm; for the rest will follow this one, and, having thrown us under foot, they will open a passage to this hill behind us.' What happened a moment after confirmed this opinion; for the queen ordered one of the best dogs to be let loose on one of the deer: this the dog pursues; the leading stag was frighted; he flies by the same way he had come there; the rest rush after him, and break out where the thickest body of the Highlanders was; they had nothing for it but to throw themselves flat on the heath, and to allow the deer to pass over them. It was told the queen that several of the Highlanders had been wounded, and that two or three had been killed outright; and the whole body had got off, had not the Highlanders, by their skill in hunting, fallen upon a stratagem to cut off the rear from the main body. It was of those that had been separated that the queen's dogs and those of the nobility made slaughter. There were killed that day three hundred and sixty deer, with five wolves, and some roes."

The quantity of deer in Great Britain has, of course, diminished with the progress of agricultural improvement. During the last century numerous forests were enclosed in England, which were formerly stocked with red deer, fallow deer, and roebucks; which, existing in an almost wild state, tempted those who lived within their range to a constant life of depredation. What the deer-stealers of the old times were, are the poachers now; and the temptation, in either case, presents a fearful cause of crime and misery.

There can be little doubt that at one period of its history, probably when the surface, which is now morass or peat bog, or cleared and under tillage, was covered with forests, deer were abundant in most parts of Scotland. There was then, probably, a variety which is now extinct, for, in some of the bogs, horns are found of larger dimensions than any that are to be seen upon the present fallow deer, or the red deer of the mountains. The red deer are now far from numerous, and are seldom, if ever, seen on the Grampians. This has, no doubt, arisen from the grazing of sheep and cattle, by which the seclusion the red deer are so fond of has been broken in upon, both in the mountains and in the valleys. As the more lucrative occupation of the soil extends into the remoter districts, the race must further and further decrease; nor is the period at which they will be wholly extinct, in all probability, very distant. Red deer are yet found in Mar Forest and Glenartney; and there are still a considerable number in the west parts of Ross and Sutherland; though the extensive and judicious improvements which, very much to the general advantage of the country, have recently been effected, under the Marquis of Stafford, have made them more rare than they were about the end of the last century. Now, unless by a person whom long observation has rendered familiar with their haunts, the country may be traversed without seeing even one. From their fleetness, and the nature of the ground on which they are found, horses and hounds are of no use in the direct chase of them, as the steed would be required to leap precipices of fifty feet, instead of gates of five bars; and the dogs would be constantly tumbling into gullies and ravines, which are cleared by the deer at one bound. They cannot be driven "with hound and horn," as was the case in the days of the "barons bold;" neither can they be collected and hemmed in, after the somewhat similar manner in which the Highland chiefs conducted their sports. Still there are a few places where a person who has been habituated to the occupation, and who does not fear to ground himself in a morass, and will submit to the other pleasures of "stalking," may occasionally find a roe. The most certain time is when the state of the weather is such as to force the herds to the well-heads, where there is brushwood near to cover the marksman.

The largest forest set apart for red deer which exists in Scotland is the forest of Athole, where a hundred thousand English acres are given up to them; and upon this large tract neither man, woman, child, sheep, or oxen are allowed to trespass, with the exception of those parties who are permitted to partake of the mysteries of deer-stalking. The sportsmen, seldom more than two in each party, set forth accompanied by a keeper who acts as general; and they are followed by two or three Highlanders, carrying spare rifles, and leading the deer-hounds. The party is preceded by the keeper, who is about twenty or thirty yards in advance, attentively examining the face of every hill with his telescope, to discover the deer that may be grazing upon it. Upon detecting a herd, a council of war is held, and the plan of operations determined upon. It is necessary to proceed with much caution, as, independent of the strong sense of smelling, seeing, and hearing, which these animals are endued with, there is always one of the herd, generally a hind, or female deer, stationed as sentinel; and upon the least suspicion being excited, the signal is given, and they are off. Great care is therefore taken in the approach to advance up the wind, and to conceal the party by taking advantage of the inequalities of the ground, preserving the strictest silence. It frequently happens that the sportsmen are obliged to make a circuit of some miles to get near them undetected; at other times they may find that they are in a situation from which they cannot extricate themselves unseen; a that case they must lie down till the herd move into a more favourable position for their purpose. Having arrived as near to them as is possible without detection, the sportsmen, after a careful examination of their rifles, still concealing themselves as much as possible, fire, and continue firing and loading as long as they remain within practicable distance. Eleven out of a herd of fifteen have been known to be killed by one person: the accidental circumstance of an echo, the sound being heard on one side and the flash appearing on the other, so puzzled the deer that they stood still, till the four last gathered courage and made off. When wounded, large hounds, of a breed between the greyhound and the bloodhound, are let loose upon the track of their blood, and they never leave it till they have brought the animal to bay, generally in some stream, where they keep him till the sportsman comes up and despatches him by shooting him through the head. It is necessary for the hunter to be very cautious in approaching him when at bay, and always to keep him down the stream from where he stands; for, if he breaks his bay, he is very likely to attack his pursuer, gore him with his horns, or trample him to pieces with his feet. This is, of all European sports, the most noble and interesting, as any person, who has tried and understands it, will testify, heightened as it is by the wildness and beauty of the scenery, the pure invigorating effect of the mountain air, the picturesque dress and appearance of the Highlanders, and the eager interest they take in a pursuit so peculiar to their own hills and so congenial to their habits.

Fallow deer are much more abundant in Scotland, not only in enclosed parks, but at large, over the country. They are found in many of the lowland plantations in Forfar and Perthshire; which seems to indicate that a restoration of the woods would lead to an increase of their numbers. Those that are found in the situations alluded to, have, no doubt, been produced by individuals which had escaped from the parks. In summer they are not often seen; but when the winter is severe, they sometimes invade the cottage gardens, in troops of six or eight together.

In a state approaching that of nature, they are most plentiful in the central part of the Grampians, from which it is probable that they may extend their numbers into all those mountain districts, where planting has been preferred to grazing. They are most numerous on the southern part of the bleak, and, generally speaking, naked ridge of Minigny, which lies between the glen of Athole on the south, and Badenoch on the north; and between the lofty summits of Ben-y-glac on the east, and the pass of Dalnavardoch on the west. The greater part of this ridge is the property of the Duke of Athole, although many deer are found on the lands of the Duke of Gordon and others, towards the east. The deer are seldom on the summits; but generally in the glens of the Tilt and Bruar. Those deer are often seen in herds of upwards of a thousand; and when, in a tract where there is no human abode for 20 or 30 miles, a long line of bucks appears on a height with their branching horns relieved upon the clear mountain sky, the sky is very imposing. During the rutting season the deer are in the fastnesses of the glens; and though they are there more frequently heard, they are not so numerously seen as in their milder moods.

Note B.—*The Elk.*

The elk is a native of Europe, America, and Asia as far as Japan. It feeds on twigs and branches of trees, and marsh plants; goes on its hoofs with a stumbling gait; its skin is hard, almost able to resist a musket ball; its horns are palmate, with short beams, frequently without beams; ears long and large, upright and slouching; its upper lip is broad, square, and deeply furrowed, hanging over the mouth; nose broad; nostrils large; its neck is short and slouching, with an upright mane; its eyes are very small, and from the corner of them a deep slit, common to all the deer kind, as well as the antelopes; its tail is very short: spacious hoofs, large and loose, making a rattling noise when travelling. The legs of elks are so long, and their necks so short, that they cannot graze on level ground, like other animals, but are obliged to browse on the tops of large plants, and the leaves or branches of trees. In all their actions they appear very uncouth.

In summer-time the elks frequent the margins of rivers and lakes, getting into the water in order to avoid the innumerable multitudes of moschettoes and other flies that pester them during that season. They are often killed by the Indians while they are crossing rivers, or swimming from the mainland to islands. When pursued in this situation, they are the most inoffensive of all animals, never making any resistance; and the young ones are so simple that, in North America, Mr. Hearne saw an Indian paddle his canoe up to one of them, and take it by the pole without the least opposition; the poor harmless animal seeming, at the same time, as contented alongside the canoe as if swimming by the side of its dam, and looking up in the faces of those who were about to become its murderers with the most fearless innocence, using its fore-feet, almost every instant, to clear its eyes of the numerous moschettoes which alighted upon it.

Elks are the easiest to tame and domesticate of any of the deer kind. They will follow their keeper to any distance from home; and at his call will return with him, without the least trouble, and without even attempting to deviate from the path. An Indian, at the factory at Hudson's bay, had, in the year 1777, two of them so tame, that when he was on his passage to Prince of Wales' Fort, in a canoe, they always followed him along the bank of the river; and at night, or any other occasion, when he landed, they generally came and fondled on him in the same manner as the most domestic animal would have done, and never attempted to stray from the tents. He did not, however, possess these animals long; for he one day crossed a deep bay in one of the lakes, in order to save a very circuitous route along it banks, and expected the creatures would, as usual, follow him round: but unfortunately at night they did not arrive; and as the howling of wolves was heard in the quarter where they were, it is supposed they had been devoured by them, for they were never afterward seen. M. D'Obsonville had a moose-deer in his possession, while in the East Indies. He procured it when only ten or twelve days old, and kept it about two years without ever tying it up. He even let it run abroad, and sometimes amused himself with making it draw in the yard, or carry little burdens. It always came when called, and he found few signs of impatience, except when it was not allowed to remain near him. When he departed from the island of Sumatra he gave it to Mr. Law of Lauristan, the governor-general, an intimate friend. This gentleman sent it to his country house, where, being kept alone, and chained, it became so furious as not to be approached without danger; even the person who every day brought his food was obliged to leave this at some distance. "After some months' absence (says M. D'Obsonville), I returned: it knew me afar off, and as I observed the efforts it made to get at me, I ran to meet it; and never shall I forget the impression which the caresses and transports of this faithful animal made upon me."

An attempt has been made at New York to render the elk useful in agricultural labours, which has been attended with success. Mr. Chancellor Livington, the President of the New York Society, had two of these animals broken to the harness. Though they had only been twice bitted, and were two years old, they appeared to be equally docile with colts of the same age. They applied their whole strength to the draught, and went on a steady pace. Their mouths appeared very tender, and some care was necessary to prevent them from being injured by the bit. If upon trial it is found that elks can be rendered useful in harness, it will be a considerable acquisition to the Americans. As their trot is very rapid, it is probable that, in light carriages, they would out-travel the horse. They are also less delicate in their food than that animal, becoming fat on hay only. They are long-lived, and more productive than any beast of burden.

The methods of hunting the elk in Canada are curious. The first and most simple is, before the lakes or rivers are frozen, multitudes of the natives assemble in their canoes, with which they form a vast crescent, each point touching the shore; whilst another party on the shore surrounds an extensive tract; they are attended by dogs which they let loose and press towards the water with loud cries. The animals alarmed by the noise, fly before the hunters, and plunge into the lake, where they are killed by the people in the canoes with lances and clubs. Another method requires a greater degree of preparation and art; the hunters enclose a large space with stakes and branches of trees, forming two sides of a triangle. The bottom opens into a second enclosure, which is fast on all sides; at the opening are hung numbers of snares, made of the slips of raw hides. They assemble as before in great troops, and with all kinds of hideous noises, drive into the enclosure not only the moose, but various other kinds of deer, with which that country abounds. Some, in forcing their way through the narrow pass, are caught in the snares by the neck or horns; whilst those who escape these, meet their fate from the arrows of the hunters, directed at them from all quarters. They are likewise frequently killed with the gun.

BOOK IV.

QUADRUPEDS OF THE HOG KIND.

CHAP. I.

INTRODUCTION.

Animals of the hog kind seem to unite in themselves all those distinctions by which others are separated. They resemble those of the horse kind in the number of their teeth, which, in all, amount to forty-four, in the length of their head, and in having but a single stomach.[1] They resemble the cow kind in their cloven hoofs, and the position of their intestines; and they resemble those of the claw-footed kind in their appetite for flesh, in their not chewing the cud, and in their numerous progeny. Thus this species serves to fill up that chasm which is found between the carnivorous kinds and those that live upon grass, being possessed of the ravenous appetite of the one, and the inoffensive nature of the other. We may consider them therefore, as of a middle nature, which we can refer neither to the rapacious nor the peaceful kinds, and yet partaking somewhat of the nature of both. Like the rapacious kinds, they are found to have short intestines; their hoofs also, though cloven to the sight, will, upon anatomical inspection, appear to be supplied with bones like beasts of prey; and the number of their teats also increase the similitude: on the other hand, in a natural state they live upon vegetables, and seldom seek after animal food, except when urged by necessity. They offend no other animal of the forest, at the same time that they are furnished with arms to terrify the bravest.

THE WILD BOAR,

Which is the original of all the varieties we find in this creature, is by no means so stupid nor so filthy an animal, as that we have reduced to tameness; he is much smaller than the tame hog, and does not vary in his colour as those of the domestic kind do, but is always found of an iron gray inclining to black; his snout is much longer than that of the tame hog, and the ears are shorter, rounder, and black; of which colour are also the feet and the tail. He roots the ground in a different manner from the common hog; for as this turns up the earth in little spots here and there, so the wild boar ploughs it up like a furrow, and does irreparable damage in the cultivated lands of the farmer. The tusks also of this animal are larger than in the tame breed, some of them being seen almost a foot long.[2] These, as is well known, grow from both the under and upper jaw, bent upwards circularly, and are exceedingly sharp at the points. They differ from the tusks of the elephant in this, that they never fall; and it is remarkable of all the hog kind that they never shed their teeth as other animals are seen to do. The tusks of the lower jaw are always the most to be dreaded, and are found to give very terrible wounds.

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[1] The animals of this tribe have four front teeth in the upper jaw, which converge at their points; and generally six in the lower jaw, which project. The canine teeth, or tusks, are two in each jaw; those in the upper jaw short, those in the lower jaw extending beyond the mouth. The snout is prominent, moveable, and has the appearance of having been abruptly cut off; the hoofs are cloven.—Ed.

[2] Buffon, vol. ix. p. 147.

The wild boar can properly be called neither a solitary nor a gregarious animal. The three first years the whole litter follows the sow, and the family lives in a herd together; they are then called beasts of company, and unite their common forces against the invasions of the wolf, or the more formidable beasts of prey. Upon this their principal safety, while young, depends; for, when attacked, they give each other mutual assistance, calling to each other with a very loud and fierce note; the strongest face the danger; they form a ring, and the weakest fall into the centre. In this position few ravenous beasts dare venture to attack them, but pursue the chase where there is less resistance and danger. However, when the wild boar is come to a state of maturity, and when conscious of his own superior strength, he then walks the forest alone and fearless. At that time he dreads no single creature, nor does he turn out of his way even for man himself. He does not seek danger, and he does not much seek to avoid it.[3]

This animal is therefore seldom attacked but at a disadvantage, either by numbers, or when found sleeping by moonlight. The hunting the wild boar is one of the principal amusements of the nobility in those countries where it is to be found. The dogs provided for this sport are of the slow heavy kind; those used for hunting the stag, or the roe-buck, would be very improper, as they would too soon come up with their prey, and, instead of a chase, would only furnish out an engagement. A small mastiff is therefore chosen; nor are the hunters much mindful of the goodness of their nose, as the wild boar leaves so strong a scent that it is impossible for them to mistake its course. They never hunt any but the largest and the oldest, which are known by their tracts. When the boar is *reared*, as is the expression for driving him from his covert, he goes slowly and uniformly forward, not much afraid, nor very far before his pursuers. At the end of every half mile, or thereabouts, he turns round, stops till the hounds come up, and offers to attack them. These, on the other hand, knowing their danger, keep off, and bay him at a distance. After they have for a while gazed upon each other with mutual animosity, the boar again slowly goes on his course, and the dogs renew their pursuit. In this manner the charge is sustained, and the chase continues till the boar is quite tired, and refuses to go any farther. The dogs then attempt to close in upon him from behind; those which are young, fierce, and unaccustomed to the chase, are generally the foremost, and often lose their lives by their ardour; those which are older and better trained are content to wait until the hunters come up, who strike at him with their spears, and after several blows, despatch or disable him. The instant the animal is killed, they cut off the testicles, which would otherwise give a taint to the flesh; and the huntsmen celebrate the victory with their horns.

THE HOG,

In a natural state is found to feed chiefly upon roots and vegetables: it seldom attacks any other animal, being content with such provisions as it procures without danger. Whatever animal happens to die in the forest, or is so wounded that it can make no resistance, becomes a prey to the hog, who seldom refuses animal food how putrid soever, although it is never at the pains of taking or procuring it alive. For this reason, it seems a glutton rather by accident than choice, content with vegetable food, and only devouring flesh when pressed by necessity, and when it happens to offer. Indeed, if we behold the hog in its domestic state, it is the most sordid and brutal animal in nature.[4] The awkwardness of its form seems to influence its appetites; and all its sensations are as gross as its shapes are unsightly. It seems possessed only of an insatiable desire of eating; and seems to make choice only of what other animals find the most offensive. But we ought to consider that the hog with us is in an unnatural state, and that it is in a manner compelled to feed in this filthy manner, from wanting that proper nourishment which it finds in the forest. When in a state of wildness, it is of all other quadrupeds the most delicate in the choice of what vegetables it shall feed on, and rejects a greater number than any of the rest. The cow, for instance, as we are assured by Linnæus, eats two hundred and seventy-six plants, and rejects two hundred and eighteen; the goat eats four hundred and forty-nine, and rejects a hundred and twenty-six; the sheep eats three hundred and eighty-seven, and rejects a hundred and forty-one; the horse eats two hundred and sixty-two, and rejects two hundred and twelve; but the hog, more nice in its provision than any of the former, eats but seventy-two plants, and rejects a hundred and seventy-one. The indelicacy of this animal is, therefore, rather in our apprehensions than in its nature, since we find it makes a very distinguishing choice in the quality of its food; and if it does not reject animal putrefaction, it may be because it is abridged in that food which is most wholesome and agreeable to it in a state of nature. This is certain, that its palate is not insensible to the difference of eatables; for where it finds variety it will reject the worst with as distinguishing a taste as any other quadruped whatsoever.[5] In the orchards of peach-trees in North America, where the hog has plenty of delicious food, it is observed, that it will reject the fruit that has lain but a few hours on the ground, and continue on the watch whole hours together for a fresh wind-fall.

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[3] M. De Dieskau tells us, that he made a wild boar so tame, that the animal, though nearly three years old, would go up stairs into his apartment, fawn upon him like a dog, and eat from his hand. He also endeavoured to bring up one which he had caught very young, and which formed such an attachment to a young lady in the house, that he accompanied her wherever she went, and slept under her bed. Once he attacked her maid as she was undressing her mistress, and, if he had been strong enough, would have done her some material injury. This lady was the only person for whom the pig showed any affection, although he was not fed by her. At last he fretted himself to death, on account of a fox which had been taken into the house to be tamed.—Ed.

[4] Buffon, vol. ix. p. 14.

However, the hog is naturally formed in a more imperfect manner than the other animals that we have rendered domestic around us, less active in its motions, less furnished with instinct in knowing what to pursue or what to avoid. Without attachment, and incapable of instruction,[6] it continues, while it lives, a useless, or rather a rapacious dependent. The coarseness of its hair, and the thickness of its hide, together with the thick coat of fat that lies immediately under the skin, render it insensible to blows or rough usage. Mice have been known to burrow in the back of these animals while fattening in the sty,[7] without their seeming to perceive it. Their other senses seem to be in tolerable perfection; they scent the hounds at a distance, and, as we have seen, they are not insensible in the choice of their provisions.

The hog is by nature stupid, inactive, and drowsy; if undisturbed it would sleep half its time; but it is frequently awaked by the calls of appetite, which when it has satisfied, it goes to rest again. Its whole life is thus a round of sleep and gluttony; and, if supplied with sufficient food, it soon grows unfit even for its own existence; its flesh becomes a greater load than its legs are able to support, and it continues to feed lying down, or kneeling, a helpless instance of indulged sensuality. The only times it seems to have passions of a more active nature, are, when it is inclined by venery, or when the wind blows with any vehemence. Upon this occasion, it is so agitated as to run violently towards its sty, screaming horribly at the same time; which seems to argue that it is naturally fond of a warm climate. It appears also to foresee the approach of bad weather, bringing straw to its sty in its mouth, preparing a bed, and hiding itself from the impending storm. Nor is it less agitated when it hears any of its kind in distress: when a hog is caught in a gate, as is often the case, or when it suffers any of the usual domestic operations of ringing or spaying, all the rest are then seen to gather round it, to lend their fruitless assistance, and to sympathize with its sufferings. They have often also been known to gather round a dog that had teased them, and kill him upon the spot.

Most of the diseases of this animal arise from intemperance; measles, imposthumes, and scrofulous swellings, are reckoned among the number. It is thought by some that they wallow in the mire to destroy a sort of louse, or insect, that is often found to infest them; however, they are generally known to live, when so permitted, to eighteen or twenty years; and the females produce till the age of fifteen. As they produce from ten to twenty at a litter, and that twice a-year, we may easily compute how numerous they would shortly become, if not diminished by human industry.[8] In the wild state they are less prolific; and a sow of the woods brings forth but once a-year, probably because exhausted by rearing up her former numerous progeny.

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[5] British Zoology, vol. i. p. 42.

[6] The various learned pigs which have been at different times exhibited in Britain, afford sufficient proof that these animals are not destitute of natural sagacity. The following is, however, an instance more truly curious than perhaps any of these:—"A gamekeeper of Sir. H Mildmay," says the Rev. Mr. Daniel, "actually broke a black sow to find game, and to back and stand. *Slut*, which was the name he gave her, was rendered as staunch as any pointer. After Sir Henry's death, this *pig-pointer* was sold by auction for a very considerable sum of money; but possibly the secret of breaking swine to the field expired with the inventor." In the island of Minorca, hogs are converted into beasts of draught; a cow, a sow, and two young horses, have been there seen yoked together, and of the four the cow drew the least. The ass and the hog are here also common helpmates, and are frequently yoked together to plough the land. In some parts of Italy, hogs are used in hunting for truffles, which grow some inches deep in the ground. A cord being tied round the hind leg of one of the animals, the beast is driven into the pastures, and wherever it stops and begins to root with its nose, truffles are always to be found. —Ed.

[7] Buffon.

[8] The astonishing fecundity of the animals now under consideration, is one of their most obvious and remarkable characters. They live and multiply in every climate of the world, with the exception of the polar regions; accordingly we find that, though their natural life would, if permitted, extend to fifteen or twenty years, yet they are capable of reproduction from nine months or a year old. Their lubricity is extreme, and even furious. The rut is almost perpetual, and the female even in a state of pregnancy will seek the male. It is even said that she will occasionally admit the advances of a male of a different species. The production of fifteen or twenty in a litter is not unfrequent, and instances have been known even of thirty-seven. The celebrated Vauban has made a calculation of the probable production of an ordinary sow, during the space of ten years. He has not comprehended the male pigs in his estimate, though they may reasonably be supposed as numerous as the females in each litter. Moreover, six young ones only, male and female, have been allowed to each, though generally they are more numerous. The result is, that the product of a single sow in eleven years, which are equivalent to ten generations, will be 6,434,838 pigs. Taking it however in round numbers, and allowing for accident, disease, and the ravages of wolves, 434,838, there will remain six millions of pigs, which is about the number existing

It would be superfluous to dwell longer upon the nature and qualities of an animal too well known to need a description; there are few, even in cities, who are unacquainted with its uses, its appetites, and way of living. The arts of fattening, rearing, guarding, and managing hogs, fall more properly under the cognizance of the farmer than the naturalist: they make a branch of domestic economy, which properly treated, may be extended to a great length; but the history of nature ought always to end where that of art begins. It will be sufficient, therefore, to observe that the wild boar was formerly a native of our country, as appears from the laws of Hoel-Dda,[9] the famous Welch legislator, who permitted his grand huntsman to chase that animal from the middle of November to the beginning of December. William the Conqueror also punished such as were convicted of killing the wild boar in his forests with the loss of their eyes. At present, the whole wild breed is extinct; but no country makes greater use of the tame kinds, as their flesh, which bears salt better than that of any other animal, makes a principal part of the provisions of the British navy.[10]

As this animal is a native of almost every country, there are some varieties found in the species. That which we call the East India breed, is lower, less furnished with hair, is usually black, and has the belly almost touching the ground; it is now common in England; it fattens more easily than the ordinary kinds, and makes better bacon.

There is a remarkable variety of this animal about Upsal,[11] which is single-hoofed, like the horse; but in no other respect differing from the common kinds. The authority of Aristotle, who first made mention of this kind, has been often called in question; some have asserted, that such a quadruped never existed, because it happened not to fall within the sphere of their own confined observation; however, at present, the animal is too well known to admit of any doubt concerning it. The hog common in Guinea differs also in some things from our own; though shaped exactly as ours, it is of a reddish colour, with long ears which end in a sharp point, and a tail which hangs down to the pastern; the whole body is covered with short red shining hair, without any bristles, but pretty long near the tail. Their flesh is said to be excellent, and they are very tame.

All these, from their near resemblance to the

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in France. "Were we to extend our calculations," says Vauban, "to the twelfth generation, we should find as great a number to result as all Europe would be capable of supporting; and were they to be continued to the sixteenth, as great a number would result as would be adequate to the abundant peopling of the globe." A remarkable instance of the fecundity of these animals occurred in this country about twenty-eight years ago. A sow belonging to Mr. Thomas Richdale, Kegworth, Leicestershire, had produced in the year 1797, 355 young ones in twenty litters; four years before it brought forth 205 in twelve litters, and afterwards it had eight litters more. The number produced in these last, added to the first, made 355. This remarkable fecundity, united with the deficiency of all other useful qualities in this animal, and the excellency of its flesh, points it out as a most obvious source of nutriment. The ease, too, with which these animals are brought up and fed, renders them a most advantageous property to the poorer classes of society. In the country there are few families that cannot rear a single pig every year, and thus obtain a cheap and nutritious diet, not to mention the profit arising from the lard, fat, &c. of the animal. In some countries the principal source of existence to the poor peasant is his pig. In Ireland these animals are brought up and fattened to a large size, and then brought to market and sold by the owner at a tolerable price; with part of this, a younger, leaner, and worse-conditioned pig is purchased, fattened in the same way, and sold at a profit.—Ed.

[9] British Zoology, vol. i. p. 44.

[10] Among the ancients the hog was in very high esteem. It was the peculiar sacrifice to Ceres, the goddess of harvest. In the island of Crete, hogs were regarded as sacred. In ancient Rome very particular attention was bestowed upon them, and the art of rearing and fattening them was much studied, an art which the Latin writers on rural economy have termed *Porculatio*. Under the emperors, gluttony and epicurism were carried to an excess equally cruel and disgusting. Among the rich there were two very famous methods of dressing this animal. The one consisted in serving up a hog entire, with one side roasted, and the other boiled. The other mode was called the *Trojan*, in allusion to the Trojan horse, whose interior was filled with combatants. The inside of the hog, from which the viscera had been withdrawn, was stuffed with victims of all kinds, such as thrushes, larks, beccaficoes, oysters, &c., the whole being bathed in the best wine, and the most exquisite gravy. So great was the expense of this dish, that it became the subject of a sumptuary law, while the barbarous modes of torturing this poor animal to death for the purpose of imparting a higher flavour to its flesh, passed unpunished and unregarded. In hot climates the flesh of swine is not good. M. Sonnini remarks, that in Egypt, Syria, and even in the southern parts of Greece, this meat, though very white and delicate, is so far from firm, and so surcharged with fat, that it disagrees with the strongest stomachs. It is therefore considered unwholesome, and this will account for its proscription by the legislators and priests of the East. Such an abstinence was doubtless indispensable to health under the burning suns of Egypt and Arabia. The Egyptians were permitted to eat pork only once a-year, on the feast day of the Moon, and then they sacrificed a number of these animals to that planet. At other times, if any one even touched a hog, he was obliged immediately to plunge into the Nile with his clothes on, by way of purification. The swine-herds formed an isolated class, the outcasts of society. They were interdicted from entering the temples or intermarrying with any other families. This aversion for swine has been transmitted to the modern Egyptians. The Copts rear no pigs, no more than the followers of Mahomet.—The Jews who borrowed from the Egyptians their horror of pigs, as well as many other peculiarities, continue their abstinence from them in colder climates, where they form one of the most useful articles of subsistence.—Ed.

[11] Amænit. Acad. vol. v. p. 465

hog, may be considered as of the same species; the East Indian hog, we well know, breeds with the common kind; whether the same obtains between it, and those of Upsal and Guinea, we cannot directly affirm; but where the external similitude is so strong, we may be induced to believe that the appetites and habits are the same. It is true, we are told, that the Guinea breed will not mix with ours, but keep separate, and herd only together; however, this is no proof of their diversity, since every animal will prefer its own likeness in its mate; and they will only then mix with another sort, when deprived of the society of their own. These, therefore, we may consider as all of the hog kind; but there are other quadrupeds, that, in general, resemble this species, which, nevertheless, are very distinct from them. Travellers, indeed, from their general form, or from their habits and way of living, have been content to call these creatures hogs also; but upon a closer inspection, their differences are found to be such as entirely to separate the kinds, and make each a distinct animal by itself.

NOTE.—*Varieties of the Hog.*

In the variety of the common hog are many races which it would be interesting and important to examine more closely than has hitherto been done. Their most usual colour is a dirty white, but some are altogether black, and some are pied. The principal races are:

The English, which acquire an extraordinary bulk, and sometimes arrive at the weight of 1,200 pounds. They are whitish, and the body much elongated. There are two other races in this country. The one of small size, produced by crossing the Chinese pig with the wild pig of North America; the other larger, from the crossing of the English pig with the Chinese.

The Jutland race is distinguished by an elongated body and pendant ears, but especially by the curve of the back and length of the limbs. It is a considerable object of commerce.

The race of Zealand is smaller than the preceding. Its ears are rather raised, and the back well furnished with silky hair. The individuals of this race, when fat, yield from one hundred and sixty to two hundred pounds of lard.

The races of Poland and Russia are generally very small and of a reddish colour.

The black race with short limbs is distinguished by the shortened proportions of the head, the folds of skin above the eyes, thick jaws, small neck, broad back, few hairs, except bristles, long body, and small straight ears. It is proper to the south of Europe, and the race of Bergamo is confounded with it. From these pigs are, or ought to be made, the Bologna sausages.

The races of France are principally that of the valley of Auge in Normandy; the head of which is small and pointed, the ears narrow, the body long and thick, the hair white and scanty, and the bones in general small; weight about six hundred pounds. That of Poitou, with a strong head and projecting forehead, large and pendant ears, elongated body, rough hair, legs large, and yet the weight not within a hundred pounds of the last. That of Perigord, with black and rough hair, short and thick neck, thick but compact body. This last race, mingled with the preceding, produces an intermediate race; which is pied, and very much in request.

The race with a single toe, or rather with three united, is doubtless one of the most important to the naturalist. This singular race, which was known to Aristotle, and whose existence has been admitted by all naturalists, has hitherto been but imperfectly described. The toes of the common pig, like all perfect toes, are formed of three phalanges. Two of these toes much shorter than the others, and which, in walking, are not placed on the ground, are situated on each side of the two middle toes, a little backwards. The two greater toes touch, and exceed the others in length by the two last phalanges. Now the small lateral toes have suffered no change in the Solipede pig; it is in the structure of the middle toes that the characters of this race consist. Two phalanges are singularly developed between the second and third; the extremity of one toe, being extended by a hoof, which serves as an intermedium to unite the two others. This union, however, is but imperfect, and seems produced only by the compression which the supernumerary hoof occasions; for amidst all these irregularities, the traces of the three hoofs are clearly distinguishable.

The Turkish pig may, moreover, be considered as a variety of the common hog, by reason of its peculiar traits. It is found pretty extensively in Hungary, and Turkey in Europe. The individuals of this race have a short and narrow head, ears erect and pointed, legs slender and short, body very short, and hairs frizzled, of an iron gray, and sometimes black or brown. It appears that this pig is more easily fattened than ours.

The Siamese pig is small, long bodied, very low on the limbs, tail pendant, ears erect and very small, few silky hairs, colour generally black, sometimes white, rarely spotted. The flesh is delicate and well-tasted. This variety is found in all the South Sea Islands very fruitful, but not profitable, on account of its small size.

The pig of Guinea, though not much known, seems to be a variety of the common hog, though some authors have made it the type of a different species. Its size is small, like the Siamese, but it is particularly distinguished from all other races by its elongated and pointed ears, and its tail descending almost to the ground. Its coat is frizzled, but soft in comparison with other pigs. It is of a reddish colour. The head seems rather slender. It is said to be frequently exported from Guinea to America.

CHAP. II.

THE PECCARY, OR TAJACU.

THAT animal which of all others most resembles the hog, and yet is of a formation very distinct from it, is called the *peccary*, or *tajacu*. It is a native of America, and found there in such numbers, that they are seen in herds of several hundreds together, grazing among the woods, and inoffensive, except when offended.

The peccary, at first view, resembles a small hog; the form of its body, the shape of its head, the length of its snout, and the form of its legs, are entirely alike; however, when we come to examine it nearer, the differences begin to appear. The body is not so bulky; its legs not so long; its bristles much thicker and stronger than those of the hog, resembling rather the quills of a porcupine than hair; instead of a tail, it has only a little fleshy protuberance, which does not even cover its posteriors; but that which is still more extraordinary, and in which it differs from all other quadrupeds whatsoever, is, that it has got upon its back a lump, resembling the navel in other animals, which is found to separate a liquor of a very strong smell. The peccary is the only creature that has those kind of glands which discharge the musky substance on that part of its body. Some have them under the belly, and others under the tail; but this creature, by a conformation peculiar to itself, has them on its back. This lump, or navel, is situated on that part of the back which is over the hinder legs; it is, in general, so covered with long bristles, that it cannot be seen, except they be drawn aside. A small space then appears, that is almost bare, and only beset with a few short fine hairs. In the middle it rises like a lump; and in this there is an orifice, into which one may thrust a common goose-quill. This hole or bag is not above an inch in depth; and round it, under the skin, are situated a number of small glands, which distil a whitish liquor, in colour and substance resembling that obtained from the civet animal. Perhaps it was this analogy, that led Dr. Tyson to say, that it smelt agreeably also, like that perfume. But this Mr. Buffon absolutely denies; affirming, that the smell is at every time, and in every proportion, strong and offensive; and to this I can add my own testimony, if that able naturalist should want a voucher.

But to be more particular in the description of the other parts of this quadruped; the colour of the body is grizzly, and beset with bristles, thicker and stronger than those of a common hog; though not near so thick as those of a porcupine, they resemble them in this respect, that they are variegated with black and white rings. The belly is almost bare; and the short bristles on the sides gradually increase in length, as they approach the ridge of the back, where some are five inches long. On the head also, between the ears, there is a large tuft of bristles that are chiefly black. The ears are about two inches and a half long, and stand upright; and the eyes resemble those of a common hog, only they are smaller. From the lower corner of the eye to the snout, is usually six inches; and the snout itself is like that of a hog, though it is but small. One side of the lower lip is generally smooth, by the rubbing of the tusk of the upper jaw. The feet and hoofs are perfectly like those of a common hog; but, as was already observed, it has no tail. There are some anatomical differences in its internal structure from that of the common hog. Dr. Tyson was led to suppose, that it had three stomachs; whereas the hog has but one: however, in this he was deceived, as Mr. Daubenton has plainly shown, that the stomach is only divided by two closings, which gives it the appearance as if divided into three; and there is no conformation that prevents the food in any part of it from going or returning to any other.

The peccary may be tamed like the hog, and has pretty nearly the same habits and natural inclinations. It feeds upon the same aliments; its flesh, though drier and leaner than that of the hog, is pretty good eating; it is improved by castration; and when killed, not only the parts of generation must be taken instantly away, but also the navel on the back, with all the glands that contribute to its supply. If this operation be deferred for only half an hour, the flesh becomes utterly unfit to be eaten.

The peccary is extremely numerous in all the parts of Southern America. They go in herds of two or three hundred together; and unite, like hogs, in each other's defence. They are particularly fierce when their young are attempted to be taken from them. They surround the plunderer, attack him without fear, and frequently make his life pay the forfeit of his rashness. When any of the natives are pursued by a herd in this manner, they frequently climb a tree to avoid them; while the peccaries gather round the root, threaten with their tusks, and their rough bristles standing erect, as in the hog kind, they assume a very terrible appearance. In this manner they remain at the foot of the tree for hours together; while the hunter is obliged to wait patiently, and not without apprehensions, until they think fit to retire.

The peccary is rather fond of the mountainous parts of the country, than the lowlands; it seems to delight neither in the marshes nor the mud, like our hogs; it keeps among the woods, where it subsists upon wild fruits, roots, and vegetables; it is also an unceasing enemy to the lizard, the toad, and all the serpent kinds, with which these uncultivated forests abound. As soon as it perceives a serpent, or a viper, it at once seizes it with its fore-hoofs and teeth, skins it in an instant, and devours the flesh. This is often seen, and may therefore be readily credited; but as to its applying to a proper vegetable immediately after, as an antidote to the poison of the animal it had devoured, this part of the relation we may very well suspect. The flesh neither of the toad nor viper, as every one now knows, are poisonous; and, therefore, there is no need of a remedy against their venom. Ray gives no credit to either part of the account; however, we can have no reason to disbelieve that it feeds upon toads and serpents; it is only the making use of a vegetable antidote that appears improbable, and which perhaps had its rise in the ignorance and credulity of the natives.

The peccary, like the hog, is very prolific; the young ones follow the dam, and do not separate till they have come to perfection. If taken at first, they are very easily tamed, and soon lose all their natural ferocity; however, they never show any remarkable signs of docility, but continue stupid and rude, without attachment, or even seeming to know the hand that feeds them. They only continue to do no mischief; and they may be permitted to run tame, without apprehending any dangerous consequences. They seldom stray far from home; they return of themselves to the sty; and do not quarrel among each other, except when they happen to be fed in common. At such times they have an angry kind of growl, much stronger and harsher than that of a hog; but they are seldom heard to scream as the former; only now and then, when frighted or irritated, they have an abrupt angry manner of blowing, like the boar.

The peccary, though like the hog in so many various respects, is, nevertheless, a very distinct race, and will not mix, nor produce an intermediate breed. The European hog has been transplanted into America, and suffered to run wild among the woods; it is often seen to herd among a drove of peccaries, but never to breed from them. They may therefore be considered as two distinct creatures: the hog is the larger and the more useful animal; the peccary, more feeble and local; the hog subsists in most parts of the world, and in almost every climate; the peccary is a native of the warmer regions, and cannot subsist in ours without shelter and assistance. It is more than probable, however, that we could readily propagate the breed of this quadruped; and that, in two or three generations, it might be familiarized to our climate; but as it is inferior to the hog in every respect, so it would be needless to admit a new domestic, whose services are better supplied in the old.[1]

CHAP. III.

THE CAPIBARA, OR CABIAI.

There are some quadrupeds so entirely different from any that we are acquainted with, that it is hard to find a well known animal to which to resemble them. In this case we must be content to place them near such as they most approach in form and habits, so that the reader may at once have some idea of the creature's shape or disposition, although perhaps an inadequate and a very confused one.

Upon that confused idea, however, it will be our business to work, to bring it by degrees to greater precision; to mark out the differences of form, and thus give the clearest notions that words can easily convey. The known animal is a kind of rude sketch of the figure we want to exhibit; from which by degrees we fashion out the shape of the creature we desire should be known; as a statuary seldom begins his work till the rude outline of the figure is given by some other hand.—In this manner, I have placed the capibara among the hog kind,[1] merely because it is more like a hog than any other animal commonly known; and yet, more closely examined, it will be found to differ in some of the most obvious particulars.

The capibara resembles a hog of about two years old, in the shape of its body, and the coarseness and colour of its hair. Like the hog, it has a thick short neck, and a rounded bristly back; like the hog, it is fond of the water and marshy places, brings forth many at a time, and like it feeds upon animal and vegetable food. But when examined more nearly, the differences are many and obvious; the head is longer, the eyes are larger, and the snout, instead of being rounded, as in the hog, is split like that of a rabbit or hare, and furnished with thick strong whiskers; the mouth is not so wide, the number and the form of the teeth are different, for it is without tusks; like the peccary, it wants a tail; and, unlike to all others of this kind, instead of a cloven hoof, it is in a manner web-footed, and thus entirely fitted for swimming, and living in the water. The hoofs before are divided into four parts, and those behind into three; between the divisions there is a prolongation of the skin, so that the foot, when spread in swimming, can beat a greater surface of water.

As its feet are thus made for the water, so it is seen to delight entirely in that element; and some naturalists have called it the *water-hog* for that reason. It is a native of South America, and is chiefly seen frequenting the borders of lakes and rivers, like the otter. It seizes the fish, upon which it preys, with its hoofs and teeth, and carries them to the edge of the lake to devour them at its ease. It lives also upon fruits, corn, and sugar-canes. As its legs are long and broad, it is often seen sitting up like a dog that is taught to beg. Its cry more nearly resembles the braying of an ass, than the grunting of a hog. It seldom goes out, except at night, and that always in company. It never ventures far from the sides of the river or the lake in which it preys; for as it runs ill, because of the length of its feet and the shortness of its legs, so its only place of safety is the water, into which it immediately plunges when pursued, and keeps so long at the bottom that the hunter can have no hopes of taking it there. The capibara, even in a state of wildness, is of a gentle nature, and, when taken young, is easily tamed. It comes and goes at command, and even shows an attachment to its keeper. Its flesh is said to be fat and tender, but from the nature of its food it has a fishy taste, like that of all those which are bred in the water. Its head, however, is said to be excellent; and in this it resembles the beaver, whose fore-parts taste like flesh, and the hinder like the fish it feeds on.

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[1] The distinctions between this animal and the hog, though not drawn from external appearance, are decided. The head is indeed shorter, the snout proportionally longer, and the tail so flat and so concealed among the bristles of its skin, that it has been said to be without one; but what chiefly distinguishes it, not only from the hog, but from all other animals, is a large gland immediately under the skin on the middle of the loins. When taken young, they may be domesticated like the hog. One which was in the possession of Mr. Pidcock, of Exeter Change, was so perfectly tame as to be allowed the range of one of the principal apartments in the menagerie. It is a native of South America, and is sometimes described under the name of the Mexican hog. —Ed.

[1] The capibara is now removed into the genus *Cavia*, or cavy tribe, to which it undoubtedly belongs, as it has all the essential characters of a cavy. It is surprising that Linnæus should have been at a loss in this respect.—Ed.

CHAP. IV.

THE BABYROUESSA, OR INDIAN HOG.

The Babyrouessa is still more remote from the hog kind than the capibara; and yet most travellers who have described this animal, do not scruple to call it the hog of Borneo, which is an island in the East Indies, where it is principally to be found. Probably this animal's figure, upon the whole, most resembles that of the hog kind, and may have induced them to rank it among the number; however, when they come to its description, they represent it as having neither the hair, the bristles, the head, the stature, nor the tail, of a hog. Its legs, we are told, are longer, its snout shorter, its body more slender, and somewhat resembling that of a stag; its hair is finer, of a gray colour, rather resembling wool than bristles, and its tail also tufted with the same. From these varieties, therefore, it can scarcely be called a hog; and yet in this class we must be content to rank it, until its form and nature come to be better known. What we at present principally distinguish it by, are four enormous tusks, that grow out of the jaws; the two largest from the upper, and the two smallest from the under. The jaw-bones of this extraordinary animal are found to be very thick and strong, from whence those monstrous tusks are seen to proceed that distinguish it from all other quadrupeds whatsoever. The two that go from the lower jaw are not above a foot long, but those of the upper are above half a yard; as in the boar, they bend circularly, and the two lower stand in the jaw as they are seen to do in that animal; but the two upper rise from the upper jaw rather like horns than teeth; and, bending upwards and backwards, sometimes have their points directed to the animal's eyes, and are often fatal by growing into them. Were it not that the babyrouessa has two such large teeth underneath, we might easily suppose the two upper to be horns; and, in fact, their sockets are directed upwards; for which reason Dr. Grew was of that opinion: but as the teeth of both jaws are of the same consistence, and as they both grow out of sockets in the same manner, the analogy between both is too strong not to suppose them of the same nature. The upper teeth, when they leave the socket, immediately pierce the upper lip of the animal, and grow as if they immediately went from its cheek. The tusks in both jaws are of a very fine ivory, smoother and whiter than that of the elephant, but not so hard or serviceable.[1]

These enormous tusks give this animal a very formidable appearance; and yet it is thought to be much less dangerous than the wild boar.[2] Like animals of the hog kind they go together in a body, and are often seen in company with the wild boar, with which, however, they are never known to engender. They have a very strong scent, which discovers them to the hounds; and when pursued they growl dreadfully, often turning back upon the dogs, and wounding them with the tusks of the lower jaw, for those of the upper are rather an obstruction than a defence. They run much swifter than the boar, and have a more exquisite scent, winding the men and the dogs at a great distance. When hunted closely, they generally plunge themselves into the sea, where they swim with great swiftness and facility, diving and rising again at pleasure; and in this manner they most frequently escape their pursuers. Although fierce and terrible when offended, yet they are peaceable and harmless when unmolested. They are easily tamed, and their flesh is good to be eaten; but it is said to putrefy in a very short time. They have a way of reposing themselves different from most other animals of the larger kind; which is by hitching one of their upper tusks on the branch of a tree, and then suffering their whole body to swing down at ease. Thus suspended from a tooth, they continue the whole night quite secure, and out of the reach of such animals as hunt them for prey.

The babyrouessa, though by its teeth and tusks it seems fitted for a state of hostility, and probably is carnivorous, yet, nevertheless, seems chiefly to live upon vegetables and the leaves of trees. It seldom seeks to break into gardens, like the boar, in order to pillage the more succulent productions of human industry, but lives remote from mankind, content with coarser fare and security. It has been said, that it was only to be found in the island of Borneo; but this is a mistake, as it is well known in many other parts both of Asia and Africa, as at the Celebes, at Estrila, Senegal, and Madagascar.[4]

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[1] The singular tusks of the babyrouessa have been very pointedly noticed by Paley, in his 'Natural Theology,' as an instance of an extraordinary structure having an unexpected use. "It has two bent teeth more than half a yard long, growing upwards, and (which is the singularity) from the upper jaw. These instruments are not wanted for offence, that service being provided for, by two tusks issuing from the under jaw and resembling those of the common boar; nor does the animal use them for defence. They might seem therefore to be both a superfluity and incumbrance. But observe the event:—the animal sleeps standing; and, in order to support its head, hooks its upper jaws upon the branches of the trees."—Ed.

[2] Buffon, vol. xxv. p. 179.

Such are the animals of the hog kind, which are not distinctly known; and even all these, as we see, have been but imperfectly examined or described. There are some others of which we have still more imperfect notices; such as the warree, a hog of the Isthmus of Darien, described by Wafer, with large tusks, small ears, and bristles like a coarse fur all over the body. This, however, may be the European hog, which has run wild in that part of the new world, as no other traveller has taken notice of the same. The Canary boar seems different from other animals of this kind, by the largeness of its tusks; and, as is judged from the skeleton, by the aperture of its nostrils, and the number of its grinders. I cannot conclude this account of those animals that are thus furnished with enormous tusks, without observing that there is a strong consent between these and the parts of generation. When castrated, it is well known that the tusks grow much smaller, and are scarcely seen to appear without the lips; but what is still more remarkable is, that in a boar, if the tusks by any accident or design be broken away, the animal abates of its fierceness and venery, and it produces nearly the same effect upon its constitution as if castration had actually taken place.[5]

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[4] Anderson's Natural History of Greenland.

[5] Lisle's Husbandry, vol. ii. p. 329.

BOOK V.

CARNIVOROUS ANIMALS.

CHAP. I.

ANIMALS OF THE CAT KIND.

WE have hitherto been describing a class of peaceful and harmless animals, that serve as the instruments of man's happiness, or, at least, that do not openly oppose him. We come now to a bloody and unrelenting tribe, that disdain to own his power, and carry on unceasing hostilities against him. All the class of the cat kind are chiefly distinguished by their sharp and formidable claws, which they can hide and extend at pleasure.[1] They lead a solitary ravenous life, neither uniting for their mutual defence, like vegetable feeders, nor for their mutual support, like those of the dog kind. The whole of this cruel and ferocious tribe seek their food alone; and except at certain seasons, are even enemies to each other. The dog, the wolf, and the bear, are sometimes known to live upon vegetable or farinaceous food; but all of the cat kind, such as the lion, the tiger, the leopard, and the ounce, devour nothing but flesh, and starve upon any other provision.

They are, in general, fierce, rapacious, subtle, and cruel, unfit for society among each other, and incapable of adding to human happiness. However, it is probable that even the fiercest could be rendered domestic, if man thought the conquest worth the trouble. Lions have been yoked to the chariots of conquerors, and tigers have been taught to tend those herds which they are known at present to destroy; but these services are not sufficient to recompense for the trouble of their keeping; so that, ceasing to be useful, they continue to be noxious, and become rebellious subjects, because not taken under equal protection with the rest of the brute creation.

Other tribes of animals are classed with difficulty; have often but few points of resemblance; and, though alike in form, have different dispositions, and different appetites. But all those of the cat kind, although differing in size, or in colour, are yet nearly allied to each other; being equally fierce, rapacious, and artful; and he that has seen one has seen all. In other creatures there are many changes wrought by human assiduity; the dog, the hog, or the sheep, are altered in their natures and forms, just as the necessities or the caprice of mankind have found fitting; but all of this kind are inflexible in their forms, and wear the print of their natural wildness strong upon them. The dogs or cows vary in different countries, but lions or tigers are still found the same; the very colour is nearly alike in all; and the slightest alterations are sufficient to make a difference in the kinds, and to give the animal a different denomination.

The cat kind are not less remarkable for the sharpness and strength of their claws, which they thrust forth from their sheath when they seize their prey, than for the shortness of their snout, the roundness of their head, and the large whiskers which grow on the upper lip. Their teeth also, which amount to the number of thirty, are very formidable, but rather calculated for tearing their prey than for chewing it: for this reason they feed but slowly; and while they eat, generally continue growling, to deter others from taking a share. In the dog kind, the chief power lies in the under jaw, which is long, and furnished with muscles of amazing strength; but in these the greatest force lies in the claws, which are extended with great ease, and their gripe is so tenacious that nothing can open it. The hinder parts in all these animals are much weaker than those before; and they seem less made for strength than agility. Nor are they endued with the swiftness of most other animals; but generally owe their subsistence rather to catching their prey by surprise than by hunting it fairly down. They all seize it with a bound, at the same time expressing their fierce pleasure with a roar; and their first grasp generally disables the captive from all further resistance. With all these qualifications for slaughter, they, nevertheless, seem timid and cowardly, and seldom make an attack, like those of the dog kind, at a disadvantage: on the contrary, they fly when the force against them is superior, or even equal to their own; and the lion himself will not venture to make a second attempt, where he has once been repulsed with success. For this reason, in countries that are tolerably inhabited, the lion is so cowardly, that he is often scared away by the cries of women and children.

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[1] The quadrupeds of this family are distinguished by having six front teeth, the intermediate ones of which are equal; the grinders are three on each side in each jaw; the tongue is furnished with rough prickles pointing backwards; and the claws are sheathed and retractile, except in the lion, which *has them retractile*, but not sheathed.

The cat, which is the smallest animal of this kind, is the only one that has been taken under human protection, and may be considered as a faithless friend, brought to oppose a still more insidious enemy.[2] It is, in fact, the only animal of this tribe whose services can more than recompense the trouble of their education, and whose strength is not sufficient to make its anger formidable. The lion, or the tiger, may easily be tamed, and rendered subservient to human command; but even in their humblest and most familiar moments, they are still dangerous; since their strength is such, that the smallest fit of anger or caprice may have dreadful consequences. But the cat, though easily offended, and often capricious in her resentments, is not endowed with powers sufficient to do any great mischief. Of all animals, when young, there is none more prettily playful than the kitten; but it seems to lose this disposition as it grows old, and the innate treachery of its kind is then seen to prevail. From being naturally ravenous, education teaches it to disguise its appetites, and to watch the favourable moment of plunder; supple, insinuating, and artful, it has learned the arts of concealing its intentions till it can put them into execution; when the opportunity offers, it at once seizes upon whatever it finds, flies off with it, and continues at a distance till it supposes its offence forgotten. The cat has only the appearance of attachment; and it may easily be perceived by its timid approaches, and side-long looks, that it either dreads its master, or distrusts his kindness; different from the dog, whose caresses are sincere, the cat is assiduous rather for its own pleasure than to please; and often gains confidence only to abuse it. The form of its body, and its temperament, correspond with its disposition; active, cleanly, delicate, and voluptuous, it loves its ease, and seeks the softest cushions to lie on. "Many of its habits, however, are rather the consequences of its formation than the result of any perverseness in its disposition; it is timid and mistrustful, because its body is weak, and its skin tender; a blow hurts it infinitely more than it does a dog, whose hide is thick, and body muscular; the long fur in which the cat is clothed entirely disguises its shape, which, if seen naked, is long, feeble, and slender; it is not to be wondered, therefore, that it appears much more fearful of chastisement than the dog, and often flies even when no correction is intended. Being also a native of the warmer climates, as will be shown hereafter, it chooses the softest bed to lie on, which is always the warmest."

The cat goes with young fifty-six days, and seldom brings forth above five or six at a time. The female usually hides the place of her retreat from the male, who is often found to devour her kittens. She feeds them for some weeks with her milk, and whatever small animals she can take by surprise, accustoming them betimes to rapine. Before they are a year old, they are fit to engender; the female seeks the male with cries; nor is their copulation performed without great pain, from the narrowness of the passage in the female. They live to about the age of ten years; and during that period they are extremely vivacious, suffering to be worried a long time before they die.

The young kittens are very playful and amusing; but their sport soon turns into malice, and they, from the beginning, show a disposition to cruelty; they often look wistfully towards the cage, sit sentinels at the mouth of a mouse-hole, and in a short time become more expert hunters than if they had received the instructions of art. Indeed, their disposition is so incapable of constraint, that all instruction would be but thrown away. It is true, that we are told of the Greek monks of the isle of Cyprus teaching cats to hunt the serpents with which the island is infested: but this may be natural to the animal itself, and they might have fallen upon such a pursuit without any instruction. Whatever animal is much weaker than themselves, is to them an indiscriminate object of destruction. Birds, young rab bits, hares, rats, and mice, bats, moles, toads, and frogs, are all equally pursued; though not, perhaps, equally acceptable. The mouse seems to be their favourite game; and, although the cat has the sense of smelling in but a mean degree, it, nevertheless, knows those holes in which its prey resides. I have seen one of them patiently watch a whole day until the mouse appeared, and continue quite motionless until it came within reach, and then seized it with a jump. Of all the marks by which the cat discovers its natural malignity, that of playing and sporting with its little captive, before killing it outright, is the most flagrant.

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[2] This description is nearly translated from Mr. Buffon: what I have added is marked with inverted commas.

The fixed inclination which they discover for this peculiar manner of pursuit, arises from the conformation of their eyes. The pupil in man, and in most other animals, is capable but of a small degree of contraction and of dilatation; it enlarges a little in the dark, and contracts when the light pours in upon it in too great quantities. In the eyes of cats, however, this contraction and dilatation of the pupil is so considerable, that the pupil, which by daylight appears narrow and small like the black of one's nail, by night expands over the whole surface of the eyeball, and, as every one must have seen, their eyes seem on fire. By this peculiar conformation, their eyes see better in darkness than light; and the animal is thus better adapted for spying out and surprising its prey.

Although the cat is an inhabitant of our houses, yet it cannot properly be called a dependent; although perfectly tame, yet it acknowledges no obedience; on the contrary, it does only just what it thinks fit, and no art can control any of its inclinations. In general, it is but half tamed; and has its attachments rather to the place in which it resides, than to the inhabitant. If the inhabitant quits the house, the cat still remains; and if carried elsewhere, seems for a while bewildered with its new situation. It must take time to become acquainted with the holes and retreats in which its prey resides, with all the little labyrinths through which they often make good an escape.

The cat is particularly fearful of water,[3] of cold, and of ill smells. It loves to keep in the sun, to get near the fire, and to rub itself against those who carry perfumes. It is excessively fond of some plants, such as valerian, marum, and cat-mint: against these it rubs, smells them at a distance, and, at last, if they be planted in a garden, wears them out.

This animal eats slowly, and with difficulty, as its teeth are rather made for tearing, than chewing its aliments. For this reason it loves the most tender food, particularly fish, which it eats as well boiled as raw. Its sleeping is very light: and it often seems to sleep, the better to deceive its prey. When the cat walks it treads very softly, and without the least noise; and as to the necessities of nature, it is cleanly to the last degree. Its fur also is usually sleek and glossy; and, for this reason, the hair is easily electrified; sending forth shining sparks, if rubbed in the dark.

"The wild cat breeds with the tame;[4] and, therefore, the latter may be considered only as a variety of the former; however, they differ in some particulars; the cat, in its savage state, is somewhat larger than the house-cat; and its fur being longer, gives it a greater appearance than it really has; its head is bigger, and its face flatter; the teeth and claws much more formidable; its muscles very strong, as being formed for rapine; the tail is of a moderate length, but very thick and flat, marked with alternate bars of black and white, the end always black; the hips and hind part of the lower joints of the leg are always black; the fur is very soft and fine: the general colour of these animals, in England, is a yellowish white, mixed with a deep gray. These colours, though they appear at first sight confusedly blended together, yet, on a close inspection, will be found to be disposed like the streaks on the skin of the tiger, pointing from the back downwards, rising from a black list, that runs from the head, along the middle of the back, to the tail. This animal is found in our larger woods; and is the most destructive of the carnivorous kinds in this kingdom. It inhabits the most mountainous and woody parts of these islands, living mostly in trees, and feeding only by night. It often happens, that the females of the tame kind go into the woods to seek mates among the wild ones. It should seem that these, however, are not original inhabitants of this kingdom, but were introduced first in a domestic state, and afterwards became wild in the woods, by ill usage or neglect. Certain it is, the cat was an animal much higher in esteem among our ancestors than it is at present. By the laws of Howel, the price of a kitten, before it could see, was to be a penny; till it caught a mouse, twopence; and when it commenced mouser, fourpence; it was required, besides, that it should be perfect in its senses of hearing and seeing, be a good mouser, have the claws whole, and be a good nurse. If it failed in any of these qualities, the seller was to forfeit to the buyer the third part of its value. If any one stole or killed the cat that guarded the prince's granary, he was to forfeit a milch ewe, its fleece and lamb, or as much wheat as when poured on the cat, suspended by the tail (the head touching the floor), would form a heap high enough to cover the tip of the former. From hence we discover, besides a picture of the simplicity of the times, a strong argument that cats were not naturally bred in our forests. An animal that could have been so easily taken, could never have been rated so highly; and the precautions laid down to improve the breed, would have been superfluous, in a creature that multiplies to such an amazing degree.

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[3] At Treddibbet mill, on the river Lowley, near Launceston, a huge brindled tom cat, according to the miller's account, would not only lie in ambush for trouts, and pounce upon them whilst playing about on the shallows, but would actually dive like an otter, under the covers and banks, and seize upon his prey with his claws and teeth.—At Caverton Mill, in Roxburghshire, a beautiful spot upon the Kale water, there was a favourite cat, domesticated in the dwelling-house, which stood at two or three hundred yards from the mill. When the mill work ceased, the water was, as usual, stopped at the dam-head; and the dam below, consequently ran gradually more shallow, often leaving trout, which had ascended when it was full, to struggle back with difficulty to the parent stream; and so well acquainted had puss become with this circumstance, and so fond was she of fish, that the moment she heard the noise of the mill-clapper cease, she used to scamper off to the dam, and up to her belly in the water, continued to catch fish like an otter. It would not be easy to cite a more curious case of animal instinct approaching to reason, and overcoming the usual habits of the species.—Mr. Moody of Jesmond, near Newcastle-upon-Tyne, had a cat, in 1822, which had been in his possession for some years, that was not only in the frequent habit of catching fish, and bringing them home alive, but even went so far as to imitate a neighbour's cat in the art, which assisted him in his enterprise, both being frequently discovered in company together watching for the fish, or prowling about on the look-out, on the opposite sides of the river, not far from each other.—ED.

[4] British Zoology.

"In our climate, we know but of one variety of the wild cat; and, from the accounts of travellers, we learn, that there are but very few differences in this quadruped in all parts of the world. The greatest difference, indeed, between the wild and the tame cat, is rather to be found internally than in their outward form. Of all other quadrupeds, the wild cat is, perhaps, that whose intestines are proportionably the smallest and the shortest. The intestines of the sheep, for instance, unravelled out, and measured according to their length, will be found to be above thirty times the length of its body; whereas the wild cat's intestines being measured out, will not be found to be above three times the length of its body. This is a surprising difference; but we may account for it, from the nature of the food in the two animals: the one living upon vegetables, which require a longer, and a more tedious preparation, before they can become a part of its body; the other living upon flesh, which requires very little alteration, in order to be assimilated into the substance of the creature that feeds upon it. The one, therefore, wanted a long canal for properly digesting and straining its food; the other but a short one, as the food is already prepared to pass the usual secretions: however, a difficulty still remains behind; the intestines of the wild cat are, by one-third, shorter than those of the tame. How can we account for this? If we say that the domestic cat, living upon more nourishing and more plentiful provision, has its intestines enlarged to the quantity with which it is supplied, we shall find this observation contradicted in the wild boar and the wolf, whose intestines are as long as those of the hog or the dog, though they lead a savage life, and, like the wild cat, are fed by precarious subsistence. The shortness, therefore, of the wild cat's intestines, is still unaccounted for; and most naturalists consider the difficulty as inexplicable. We must leave it, therefore, as one of those difficulties which future observation or accident are most likely to discover."

This animal is one of those few which are common to the new continent, as well as the old. When Christopher Columbus first discovered that country, a hunter brought him one, which he had discovered in the woods: it was of the ordinary size, the tail very long and thick. They were common also in Peru, although they were not rendered domestic.[5] They are well known also in several parts of Africa, and many parts of Asia. In some of these countries they are of a peculiar colour, and inclining to blue. In Persia, Pietro della Valle informs us, that there is a kind of cat, particularly in the province of Chorazan. of the figure and form of the ordinary one, but infinitely more beautiful in the lustre and colour of its skin. It is of a gray blue, without mixture, and as soft and shining as silk. The tail is very long, and covered with hair six inches long, which the animal throws upon its back, like the squirrel. These cats are well known in France; and have been brought over into England, under the name of the *blue cat*, which, however, is not their colour.

Another variety of this animal is called by us the *lion cat;* or, as others more properly term it, the *cat of Angola*. These are larger than the common cat, and even than the wild one. Their hair is much longer, and hangs about their head and neck, giving this creature the appearance of a lion. Some of these are white, and others of a dun colour. These come from Syria and Persia, two countries which are noted for giving a long soft hair to the animals which are bred in them. The sheep, the goats, the dogs, and the rabbits, of Syria, are all remarkable for the fine glossy length and softness of their hair; but particularly the cat, whose nature seems to be so inflexible, conforms to the nature of the climate and soil, loses its savage colour, which it preserves almost in every other part of the world, and assumes the most beautiful appearance. There are some other varieties in this animal, but rather in colour than in form; and, in general, it may be remarked, that the cat, when carried into other countries, alters but very little, still preserving its natural manners, habits, and conformation.

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[5] Yet Southey, in his 'History of the Brazils, narrates that the first couple of cats which were carried to Cuyaba, sold for a pound weight of gold. As there was a plague of rats in the settlement, these cats were purchased as a speculation, which proved an excellent one. The first kittens were sold for the sum of thirty oitavas each. The next generation were worth twenty; and the price gradually fell as the inhabitants became stocked with these beautiful and useful creatures. Montenegro presented to the elder Almagro the first cat which was brought to South America, and was rewarded for it with six hundred pesos. Camden records a story similar to that famous one of Whittington and his cat,—"How Alphonse, a Portuguese, being wrecked on the coast of Guinea, and being presented, by the king thereof, with his weight in gold, for a cat to kill their mice, and an ointment to kill their flies, which he improved within five years, to six thousand pounds on the place, and, returning to Portugal, after fifteen years' traffic, became the third man in the kingdom." Sir W. Gore Ouseley quotes a similar legend from a Persian MS.—Ed.

SUPPLEMENTARY NOTE.

It would be a singular inquiry, though somewhat difficult, to ascertain what qualities the cat has lost by domestication, and what it has acquired. Some of its instincts appear perfect as in the natural state—some more matured—and some nearly subdued. In a singular old work on natural history, '*Bartholomæus de Proprietatibus Rerum*,' which was translated into English by Thomas Berthlet, and printed by Wynkyn de Worde as early as 1498, we have a very curious description of the cat, which sums up most of the properties of the animal in a quaint and amusing way. For example:—"He is most like to the leopard, and hath a great mouth, and saw-teeth and sharp, and long tongue, and pliant, thin, and subtle; and lappeth therewith when he drinketh, as other beasts do that have the nether lip shorter than the over; for, by cause of unevenness of lips, such beasts suck not in drinking, but lap and lick, as Aristotle saith, and Plinius also. And he is a full lecherous beast in youth, swift, pliant, and merry, and leapeth and riseth on all things that is tofore him; and is led by a straw, and playeth therewith: and is a right heavy beast in age and full sleepy, and lieth slyly in wait for mice; and is ware where they bene more by smell than by sight, and hunteth and riseth on them in privy places; and when he taketh a mouse, he playeth therewith, and eateth him after the play; and is a cruel beast when he is wild, and dwelleth in woods, and hunteth there small wild beasts, as conies and hares." The same cruelty belongs to the domestic cat as the wild—that instinct is never subdued. But the range of its food is limited by its hereditary habits of domestication.

The ability of cats to seize upon their ordinary prey, mice or birds, does not appear to lose any thing by domestication. The extraordinary patience with which a cat will watch a mouse-hole, for hours, is doubtless a natural property. This determined bending of the will to one object is probably a principal cause of the fascination which some serpents possess. In a very agreeable book recently published, 'The Journal of a Naturalist,' we find several instances of this power being exercised by hawks upon the smaller birds. The author of that Journal says, "there can be no doubt of the fact, that instinctive terror will subdue the powers of some creatures, rendering them stupified and motionless at the sudden approach of danger." Cats, in some degree, are supposed to possess this power of terrifying their prey. Montaigne gives a story illustrative of the notion: "There was at my house a little while ago, a cat seen watching a bird upon the top of a tree, and for some time they mutually fixed their eyes upon each other. At length the bird let herself fall dead into the cat's claws, either dazzled and astonished by the force of imagination, or drawn by some attractive power in the cat. This is similar to the story of a falconer who having earnestly fixed his eyes upon a kite in the air, laid a wager that he would bring her down by the power of sight alone, and succeeded, as it was said; for when I borrow a tale of this kind, I charge it upon the consciences of those from whom I have it." There is no doubt that a mouse will sometimes suddenly yield itself to the power of its enemy. Montaigne very properly doubts the story of the falconer; though the human eye has certainly great power, particularly in warding off the attack of a dog or a cow.

One of the most remarkable properties of a domestic cat is the anxiety with which it makes itself acquainted, not only with every part of its usual habitation, but with the dimensions and external qualities of every object by which it is surrounded. Cats do not very readily adapt themselves to a change of houses; but we have watched the process by which one, whose attachment to a family is considerable, reconciles itself to such a change. He surveys every room in the house, from the garret to the cellar; if a door is shut, he waits till it be opened to complete the survey; he ascertains the relative size and position of every article of furniture; and when he has acquired this knowledge, he sits down contented with his new situation. It appears necessary to a cat that he should be intimately acquainted with every circumstance of his position, in the same way that a general first examines the face of the country in which he is to conduct his operations. If a new piece of furniture, if even a large book or portfolio, is newly placed in a room which a cat frequents, he walks round it, smells it, takes note of its size and appearance, and then never troubles himself further about the matter. This is, probably, an instinctive quality; and the wild cat may, in the same way, take a survey of every tree or stone, every gap in a brake, every path in a thicket within the ordinary range of its operations. The whiskers of the cat, as we have mentioned in the case of the lion, enable it to ascertain the space through which its body may pass, without the inconvenience of vainly attempting such a passage.

The memory of a cat must be very strong, to enable it to understand this great variety of *local* circumstances, after a single observation. The same power of memory leads this animal, much as its affection may be doubted, to know the faces of individuals. We have seen a cat exhibit manifest delight upon the return of its master, or of a person from whom it had received peculiar kindness. There are several instances of strong attachment to the human race in cats, though in number and intensity they fall far short of the attachment of the dog. The earl of Southampton, the friend and companion of the earl of Essex in his fatal insurrection, was one day surprised by a visit from his favourite cat, which is said to have reached its master, by descending the chimney of his apartment. M. Zimmerman, a schoolmaster at Thorn, had a cat, which had been the constant companion of one of his sons from his infancy, and they were mutually attached. The child became sick, when the cat kept close to his bed, day and night. He died, and the affectionate cat would not quit his remains till they were interred. She then crept into a retired corner of the house, and, refusing sustenance, pined herself to death. Cats have sometimes, also, great affection to other animals, which becomes a reciprocal feeling. The celebrated stallion, the Godolphin Arabian, and a black cat, were, for many years, the warmest friends. When the horse died, in 1753, the cat sat upon his carcase till it was put under ground; and then, crawling slowly and reluctantly away, was never seen again, till her dead body was found in a hay-loft. Stubbs painted the portraits of the Arabian and the cat. There was a hunter in the late King's stables at Windsor, to which a cat was so attached, that whenever he was in the stable, the creature would never leave her usual seat upon the horse's back, and the horse was so well pleased with the attention, that to accommodate his friend, he slept, as horses will sometimes do, standing. This, however, was found to injure his health; and the cat was at length removed to a distant part of the country.

The effects of discipline upon the cat are very inferior to the influence of chastisement or caresses upon the dog. The dog, when he is beaten or reproved for a particular offence, seldom repeats it; the cat, as far as we have seen, can never be prevented importuning for food, jumping upon you—sitting in your chair—clambering upon a table—tearing furniture—scratching up plants—however constantly it may be beaten for these annoyances. Cats may be taught to perform tricks, such as leaping over a stick, but they always do such feats unwillingly. De la Croix relates the following almost incredible instance of sagacity in a cat: "I once saw," says he, "a lecturer upon experimental philosophy place a cat under the glass receiver of an air-pump, for the purpose of demonstrating that very certain fact, that life cannot be supported without air and respiration. The lecturer had already made several strokes with the piston, in order to exhaust the receiver of its air, when the animal, who began to feel herself very uncomfortable in the rarefied atmosphere, was fortunate enough to discover the source from which her uneasiness proceeded. She placed her paw upon the hole through which the air escaped, and thus prevented any more from passing out of the receiver. All the exertions of the philosopher were now unavailing; in vain he drew the piston: the cat's paw effectually prevented its operation. Hoping to effect his purpose, he let air again into the receiver, which, as soon as the cat perceived, she withdrew her paw from the aperture; but whenever he attemped to exhaust the receiver, she applied her paw as before."

One of the most remarkable peculiarities of the domestic cat is the property of which its fur possesses of yielding electric sparks by rubbing. In frosty weather this is occasionally very extraordinary. Mr. White says, speaking of the frost of 1785, "during these two Siberian days, my parlour cat was so electric, that had a person stroked her, and been properly insulated, the shock might have been given to a whole circle of people."

It is a very prevalent notion that cats are fond of sucking the breath of infants, and consequently of producing disease and death. Upon the slightest reflection nothing can be more obvious than that it is impossible for a cat to suck an infant's breath, at least so as to do it any injury; for even on the supposition that they did so, the construction of their mouth must preclude them from interrupting the process of breathing by the mouth and the nose at the same time. The vulgar notion must have arisen from cats nestling about infants in beds and cradles to procure warmth. Cats are particularly solicitous to be comfortably placed as to temperature. In winter they get before the fire to sleep; in summer they seek the shade of a tree, where the air is fresh and cooling.—Ed.

THE LION.

The influence of climate upon mankind is very small;[6] he is found to subsist in all parts of the earth, as well under the frozen poles as beneath the torrid zone; but in animals, the climate may be considered as congenial, and a kind of second nature. They almost all have their particular latitudes, beyond which they are unable to subsist; either perishing with a moderate cold, or dying for want of a frozen air, even in a temperate climate. The rein-deer is never seen to depart from the icy fields of the north; and on the contrary, the lion degenerates, when taken from beneath the line. The whole earth is the native country of man; but all inferior animals have each their own peculiar districts.

Most terrestrial animals are found larger, fiercer, and stronger in the warm, than in the cold or temperate climates. They are also more courageous and enterprising; all their dispositions seeming to partake of the ardour of their native soil. The lion produced under the burning sun of Africa, is of all others the most terrible, the most undaunted. The wolf or the dog, instead of attempting to rival him, scarce deserve to attend his motions, or become his providers. Such, however, of these animals as are bred in a more temperate climate, or towards the tops of cold and lofty mountains, are far more gentle, or, to speak more properly, far less dangerous than those bred in the torrid valleys beneath. The lions of Mount Atlas, the tops of which are covered in eternal snows, have neither the strength nor the ferocity of the lions of Bildulgerid or Zaara, where the plains are covered with burning sands. It is particularly in these frightful deserts that those enormous and terrible beasts are found, that seem to be the scourge and the terror of the neighbouring kingdoms. Happily indeed the species is not very numerous; and it seems to be diminishing daily: for those who have travelled through these countries assure us, that there are by no means so many there at present as were known formerly; and Mr. Shaw observes that the Romans carried fifty times as many lions from Libya, in one year, to combat in their amphitheatres, as are to be found in the whole country at this time. The same remark is made with regard to Turkey, to Persia, and the Indies; where the lions are found to diminish in their numbers every day. Nor is it difficult to assign the cause of this diminution: it is obvious that it cannot be owing to the increase of the force of other quadrupeds, since they are all inferior to the lion, and consequently, instead of lessening the number, only tend to increase the supplies on which they subsist; it must therefore be occasioned by the increase of mankind, who is the only animal in nature capable of making head against these tyrants of the forest, and preventing their increase. The arms even of a Hottentot or a Negro make them more than a match for this powerful creature; and they seldom make the attack without coming off victorious. Their usual manner is to find out his retreat, and, with spears headed with iron, to provoke him to the combat: four men are considered as sufficient for this encounter; and he against whom the lion flies, receives him upon his spear, while the others attack him behind; the lion, finding himself wounded in the rear, turns that way, and thus gives the man he first attacked an opportunity to recover. In this manner they attack him on all sides; until, at last, they entirely disable, and then despatch him. This superiority in the numbers, and the arts of man, that are sufficient to conquer the lion, serve also to enervate and discourage him; for he is brave only in proportion to the success of his former encounters. In the vast deserts of Zaara, in the burning sands that lie between Mauritania and Negroland, in the uninhabited countries that lie to the north of Caffraria, and, in general, in all the deserts of Africa, where man has not fixed his habitation, the lions are found in great numbers, and preserve their natural courage and force. Accustomed to measure their strength with every animal they meet, the habit of conquering renders them intrepid and terrible. Having never experienced the dangerous arts and combinations of man, they have no apprehensions from his power. They boldly face him, and seem to brave the force of his arms. Wounds rather serve to provoke their rage than repress their ardour. They are not daunted even with the opposition of numbers; a single lion of the desert often attacks an entire caravan; and, after an obstinate combat, when he finds himself overpowered, instead of flying, he continues to combat, retreating and still facing the enemy, till he dies. On the contrary, the lions which inhabit the peopled countries of Morocco or India, having become acquainted with human power, and experienced man's superiority, have lost all their courage so as to be scared away with a shout; and seldom attack any but the unresisting flocks or herds, which even women and children are sufficient to protect.

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[6] This description is principally taken from Mr. Buffon: such parts as are added from others, I have marked with inverted commas.

This alteration in the lion's disposition sufficiently shows that he might easily be tamed, and admit of a certain degree of education. "In fact, nothing is more common than for the keepers of wild beasts to play with this animal, to pull out his tongue, and even to chastise him without a cause. He seems to bear it all with the utmost composure; and we very rarely have instances of his revenging these unprovoked sallies of impertinent cruelty. However, when his anger is at last excited, the consequences are terrible. Labat tells us of a gentleman who kept a lion in his chamber, and employed a servant to attend it; who, as is usual, mixed his blows with caresses. This ill-judged association continued for some time; till one morning the gentleman was awakened by a noise in his room, which at first he could not tell the cause of; but drawing the curtains, he perceived a horrid spectacle; the lion growling over the man's head, which he had separated from the body, and tossing it round the floor. He immediately, therefore, flew into the next room, called to the people without, and had the animal secured from doing further mischief." However, this single account is not sufficient to weigh against the many instances we every day see of this creature's gentleness and submission. He is often bred up with other domestic animals, and is seen to play innocently and familiarly among them; and, if it ever happens that his natural ferocity returns, it is seldom exerted against his benefactors. As his passions are strong, and his appetites vehement, one ought not to presume that the impressions of education will always prevail; so that it would be dangerous in such circumstances to suffer him to remain too long without food, or to persist in irritating and abusing him: however, numberless accounts assure us that his anger is noble, his courage magnanimous, and his disposition grateful. He has been often seen to despise contemptible enemies, and pardon their insults, when it was in his power to punish them. He has been seen to spare the lives of such as were thrown to be devoured by him, to live peaceably with them, to afford them a part of his subsistence, and sometimes to want food himself rather than deprive them of that life which his generosity had spared.

It may also be said that the lion is not cruel, since he is so only from necessity, and never kills more than he consumes. When satiated, he is perfectly gentle; while the tiger, the wolf, and all the inferior kinds, such as the fox, the pole-cat, and the ferret, kill without remorse, are fierce without cause, and, by their indiscriminate slaughter, seem rather to satisfy their malignity than their hunger.

The outward form of the lion seems to speak his internal generosity. His figure is striking, his look confident and bold, his gait proud, and his voice terrible. His stature is not overgrown, like that of the elephant or rhinoceros; nor is his shape clumsy, like that of the hippopotamus or the ox. It is compact, well proportioned, and sizeable; a perfect model of strength joined with agility. It is muscular and bold, neither charged with fat nor unnecessary flesh. It is sufficient but to see him in order to be assured of his superior force. His large head surrounded with a dreadful mane; all those muscles that appear under the skin swelling with the slightest exertions; and the great breadth of his paws, with the thickness of his limbs, plainly evince that no other animal in the forest is capable of opposing him. He has a very broad face, that, as some have imagined, resembles the human. It is surrounded with very long hair, which gives it a very majestic air. The top of the head, the temples, the cheeks, the under-jaw, the neck, the breast, the shoulder, the hinder part of the legs, and the belly, are furnished with it, while all the rest of the body is covered with very short hair, of a tawny colour. "The length of the hair in many parts, and the shortness of it in others, serves a good deal to disguise this animal's real figure. The breast, for instance, appears very broad, but in reality it is as narrow and contracted in proportion as that of the generality of dogs and horses. For the same reason, the tail seems to be of an equal thickness from one end to the other, on account of the inequality of the hair with which it is encompassed; it being shorter near the insertion, where the flesh and bones are large, and growing longer in proportion as its real thickness lessens toward the point, where it ends in a tuft. The hair about the neck and the breast is not different from that on the rest of the body, except in the length of it; nor is each hair pointed, as in most other animals, but of an equal thickness from one end to the other. The neck is very strong, but not composed of one solid bone, as Aristotle has imagined; on the contrary, though very short and muscular, it has as many bones as the camel or the horse; for it is universal to all quadrupeds to have seven joints in the neck; and not one of them have either more or less. However, the muscles in the neck of the lion, that tie the bones together, are extremely strong, and have somewhat the appearance of bones; so that ancient authors, who have treated of this animal, have mistaken the whole for a single bone. The tongue is rough, and beset with prickles as hard as a cat's claws; these have the grain turned backwards; so that it is probable a lion, if it should attempt to lick a man's hand, as we are told it sometimes does, would tear off the skin. The eyes are always bright and fiery; nor even in death does this terrible look forsake them. In short, the structure of the paws, teeth, eyes, and tongue, are the same as in a cat; and also in the inward parts these two animals so nearly resemble each other, that the anatomist's chief distinction arises merely from the size."

The lion has, as was observed before, a large mane, which grows every year longer as the animal grows older: the lioness is without this ornament at every age. This mane is not coarse or rough as in a horse, but composed of the same hair with the rest of the body, lengthened and shining. The mane, as well as the rest of the body, is of a yellow colour; nor is there ever any difference to be found in the colour of one lion from that of another. What the ancients might have said concerning black lions, or white, or streaked like the tiger, is not confirmed by modern experience; so that these varieties have never been seen, or exist no longer.

It is usually supposed that the lion is not possessed of the sense of smelling in such perfection as most other animals. It is also observed, that too strong a light greatly incommodes him. This is more than probable from the formation of his eyes, which, like those of the cat, seem fitted for seeing best in the dark. For this reason he seldom appears in open day, but ravages chiefly by night; and not only the lion, but all other animals of the cat kind, are kept off by the fires which the inhabitants light to preserve their herds and flocks; the brightness of the flame dazzles their eyes, which are only fitted for seeing in the dark; and they are afraid to venture blindly into those places which they know to be filled with their enemies.[7] "It is equally true of all this kind, that they hunt rather by the sight than the smell: and it sometimes happens that the lion pursues either the jackal or the wild dog, while they are hunting upon the scent; and, when they have run the beast down, he comes in and monopolizes the spoil. From hence, probably, may have arisen the story of the lion's provider: these little industrious animals may often, it is true, provide a feast for the lion; but they have hunted merely for themselves, and he is an unwelcome intruder upon the fruits of their toil."

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[7] To the traveller in Africa the lion is formidable not at night only; he lies in his path, and is with difficulty disturbed to allow a passage for his waggons and cattle, even when the sun is shining with its utmost brilliancy; or he is roused from some bushy place on the road-side, by the indefatigable dogs which always accompany a caravan. Mr. Burchell has described, with great spirit, an encounter of this nature:—"The day was exceedingly pleasant, and not a cloud was to be seen. For a mile or two we travelled along the banks of the river, which in this part abounded in tall mat-rushes. The dogs seemed much to enjoy prowling about and examining every bushy place, and at last met with some object among the rushes which caused them to set up a most vehement and determined barking. We explored the spot with caution, as we suspected, from the peculiar tone of their bark, that it was what it proved to be, lions. Having encouraged the dogs to drive them out, a task which they performed with great willingness, we had a full view of an enormous black-maned lion and lioness. The latter was seen only for a minute, as she made her escape up the river, under concealment of the rushes; but *the lion* came steadily forward and stood still to look at us. At this moment we felt our situation not free from danger, as the animal seemed preparing to spring upon us, and we were standing on the bank at the distance of only a few yards from him, most of us being on foot and unarmed, without any visible possibility of escaping. I had given up my horse to the hunters, and was on foot myself, but there was no time for fear, and it was useless to attempt avoiding him. I stood well upon my guard, holding my pistols in my hand with my finger upon the trigger, and those who had muskets kept themselves prepared in the same manner. But at this instant the dogs boldly flew in between us and the lion, and surrounding him, kept him at bay by their violent and resolute barking. The courage of these faithful animals was most admirable; they advanced up to the side of the huge beast, and stood making the greatest clamour in his face, without the least appearance of fear. The lion, conscious of his strength, remained unmoved at their noisy attempts, and kept his head turned towards us. At one moment, the dogs, perceiving his eyes thus engaged, had advanced close to his feet, and seemed as if they would actually seize hold of him, but they paid dearly for their imprudence, for, without discomposing the majestic and steady attitude in which he stood fixed, he merely moved his paw, and at the next instant I beheld two lying dead. In doing this, he made so little exertion that it was scarcely perceptible by what means they had been killed. Of the time which we had gained by the interference of the dogs, not a moment was lost; we fired upon him; one of the balls went through his side just between the short ribs, and the blood immediately began to flow, but the animal still remained standing in the same position. We had now no doubt that he would spring upon us; every gun was instantly re-loaded; but happily we were mistaken, and were not sorry to see him move quietly away; though I had hoped in a few minutes to have been enabled to take hold of his paw without danger. This was considered, by our party, to be a lion of the largest size, and seemed, as I measured him by comparison with the dogs, to be, though less bulky, as large as an ox. He was certainly as long in body, though lower in stature; and his copious mane gave him a truly formidable appearance. He was of that variety

The lion, when hungry, boldly attacks all animals that come in his way; but as he is very formidable, and as they all seek to avoid him, he is often obliged to hide, in order to take them by surprise. For this purpose he crouches on his belly in some thicket, or among the long grass, which is found in many parts of the forest; in this retreat he continues, with patient expectation, until his prey comes within a proper distance, and he then springs after it, fifteen or twenty feet, and often seizes it at the first bound. If he misses the effort, and in two or three reiterated springs cannot seize his prey, he continues motionless for a time, seems to be very sensible of his disappointment, and waits for a more successful opportunity. In the deserts and forests his most usual prey are the gazelles and the monkeys, with which the torrid regions abound. The latter he takes when they happen to be on the ground, for he cannot climb trees like the cat or the tiger. He devours a great deal at a time, and generally fills himself for two or three days to come. His teeth are so strong that he very easily breaks the bones, and swallows them with the rest of the body. It is reported that he sustains hunger a very long time, but thirst he cannot support in an equal degree, his temperament being extremely hot; some have even asserted that he is in a continual fever. He drinks as often as he meets with water, lapping it like a cat, which, as we know, drinks but slowly. He generally requires about fifteen pounds of raw flesh in a day; he prefers that of live animals, and particularly those which he has just killed. He seldom devours the bodies of animals when they begin to putrefy, and he chooses rather to hunt for a fresh spoil, than to return to that which he had half-devoured before. However, though he usually feeds upon fresh provision, his breath is very offensive, and his urine insupportable.

The roaring of the lion is so loud, that when it is heard in the night, and re-echoed by the mountains, it resembles distant thunder. This roar is his natural note; for when enraged he has a different growl, which is short, broken, and reiterated. The roar is a deep hollow growl, which he sends forth five or six times a-day, particularly before rains. The cry of anger is much louder and more formidable. This is always excited by opposition; and upon those occasions, when the lion summons up all his terrors for the combat, nothing can be more terrible. He then lashes his sides with his long tail, which alone is strong enough to lay a man level.[8] He moves his mane in every direction; it seems to rise and stand like bristles round his head; the skin and muscles of his face are all in agitation; his huge eyebrows half cover his glaring eyeballs; he dis-

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which the Hottentots and Boors distinguish by the name of the *black lion*, on account of the blacker colour of the mane, and which is said to be always larger and more dangerous than the other, which they call the *pale lion* (vaal leeuw). Of the courage of a lion I have no very high opinion, but of his majestic air and movements, as exhibited by this animal, while at liberty in his native plains, I can bear testimony. Notwithstanding the pain of a wound, of which he must soon afterwards have died, moved slowly away with a stately and measured step. At the time when men first adopted the lion as an emblem of courage, it would seem that they regarded great size and strength as indicating it; but they were greatly mistaken in the character they have given to this indolent skulking animal, and have overlooked a much better example of true courage, and of other virtues also, in the bold and faithful dog." Mr. Burchell, we learn from the foregoing extract, is not inclined to maintain the courage of the African lion, whatever impression he may have had of his extraordinary physical strength. The natural habits of the lion are certainly those of treachery; he is not disposed, under any circumstances, to meet his prey face to face; and he is particularly unwilling to encounter man when he crosses him in the full blaze of day. The inability of his eye (in common with most other of the cat tribe) to bear a strong light, may account in a great degree for this circumstance, which has probably brought upon him much of the reproach of being a skulking, cowardly animal. But we apprehend that there were periods in the history of African colonization when the lion was of a bolder nature in his encounters with mankind; that the dread of fire-arms has become, in some degree, a habit of the species; and that he has sagacity, or hereditary instinct, to know that a flash and a loud sound is often followed by a speedy death or a grievous injury.—ED.

[8] Homer, and many other ancient poets, both Greek and Latin, when they describe an enraged lion, relate that he stimulates himself with blows of his tail; and Pliny, indeed, calls the tail the index of the lion's mind: for, says he, "when the tail is at rest, the animal is quiet, gentle, and seems pleased, which is seldom, however, the case; and anger is much more frequent with him, in the commencement of which he lashes the ground, but, as it increases, his sides, as if with the view of rousing it to a higher pitch." Again, Alexander Aphrodisiensis has, among his Problemata, the following:—"Why, since the moving of the tail is, in most animals, a sign of their recognition of friends, does the lion lash his sides, when enraged, and the bull in the same manner?" But the ancient commentator of Homer, who commonly goes by the name of Didymus Alexandrinus, asserts, with reference to the place in the Iliad, Book XX., where it is mentioned, "that the lion has a black prickle on its tail among the hair, like a horn, when punctured with which, it is still more irritated by the pain." This opinion, however, was regarded by modern anatomists as a mere fiction, until Professor Blumenbach determined the truth of it. A lioness, which was presented to him, having died, he searched for the spine, and detected it in the skin, where he found a singular follicle of a glandular appearance, to which the prickle firmly adhered.—ED.

covers his teeth, which are formed rather for destruction than chewing his food; he shows his tongue covered with points, and extends his claws, which appear almost as long as a man's fingers. Prepared in this manner for war, there are few animals that will venture to engage him; and even the boldest of the human kind are daunted at his approach. The elephant, the rhinoceros, the tiger, and the hippopotamus, are the only animals that are not afraid singly to make opposition.

"Nevertheless, neither the leopard nor the wild boar, if provoked, will shun the combat: they do not seek the lion to attack, but will not fly at his approach; they wait his onset, which he seldom makes unless compelled by hunger; they then exert all their strength, and are sometimes successful. We are told of the combat of a lion and a wild boar in a meadow near Algiers, which continued for a long time with incredible obstinacy. At last both were seen to fall by the wounds they had given each other; and the ground all about them was covered with their blood. These instances, however, are very rare, for the lion is in general the undisputed master of the forest. Man is the only creature that attacks him with almost certain success; with the assistance of dogs and horses which are trained to the pursuit. These animals, that, in a state of nature, would have fled from the presence of the lion in an agony of consternation, when conscious of the assistance of man, become pursuers in turn, and boldly hunt their natural tyrant. The dogs are always of the large breed; and the horses themselves, as Gessner assures us, must be of that sort called *charossi*, or lion-eyed, all others of this kind flying at the sight of the lion, and endeavouring to throw their riders. When the lion is roused, he recedes with a slow proud motion; he never goes off directly forward, nor measures his paces equally, but takes an oblique course, going from one side to the other, and bounding rather than running. When the hunters approach him, they either shoot or throw their javelins; and in this manner disable him before he is attacked by the dogs, many of whom he would otherwise destroy. He is very vivacious, and is never killed at once, but continues to fight desperately, even after he has received his mortal blow. He is also taken by pitfalls; the natives digging a deep hole in the ground, and covering it slightly over with sticks and earth, which, however, give way beneath his weight, and he sinks to the bottom, from whence he has no means of escape. But the most usual manner of taking this animal is while a cub, and incapable of resistance. The place near the den of the lioness is generally well-known by the greatness of her depredations on that occasion; the natives, therefore, watch the time of her absence, and, aided by a swift horse, carry off her cubs; which they sell to strangers, or to the great men of their country."

The lion, while young and active, lives by hunting in the forest, at the greatest distance from any human habitation; and seldom quits this retreat while able to subsist by his natural industry; but when he becomes old, and unfit for the purposes of surprise, he boldly comes down into places more frequented, attacks the flocks and herds that take shelter near the habitation of the shepherd or the husbandman, and depends rather upon his courage than his address for support. It is remarkable, however, that when he makes one of these desperate sallies, if he finds men and quadrupeds in the same field, he only attacks the latter, and never meddles with men unless they provoke him to engage. It is observed that he prefers the flesh of camels to any other food: he is likewise said to be fond of that of young elephants; these he often attacks before their trunk is yet grown; and, unless the old elephant comes to their assistance, he makes them an easy prey.

The lion is terrible upon all occasions, but particularly at those seasons when he is incited by desire, or when the female has brought forth. It is then that the lioness is seen followed by eight or ten males, who fight most bloody battles among each other, till one of them becomes victorious over all the rest. She is said to bring forth in spring, and to produce but once a-year. "With respect to the time of gestation, naturalists have been divided, some asserting that the lioness went with young six months, and others but two. The time also of their growth and their age have hitherto been left in obscurity; some asserting that they acquired their full growth in three years, and others that they required a longer period to come to perfection; some saying (and among this number is Mr. Buffon) that they lived to but twenty or twenty-two years at most; others making their lives even of shorter duration. All these doubts are now reduced to certainty; for we have had several of these animals bred in the Tower; so that the manner of their copulation, the time of their gestation, the number they bring forth, and the time they take to come to perfection, are all pretty well known. Although the lion emits his urine backwards, yet it couples in the ordinary manner, and as was said before, his internal structure in almost every respect resembles that of a cat. The lioness, however, is upon these occasions particularly fierce, and often wounds the lion in a terrible manner. She goes with young, as I am assured by her keeper, no more than five months: the young ones, which are never more than two in number when brought forth, are about the size of a large pug-dog, harmless, pretty, and playful; they continue the teat for twelve months, and the animal is more than five years in coming to perfection. As to its age, from its imprisoned state, we can have no certainty; since it is very probable that being deprived of its natural climate, food, and exercise, its life must be very much abridged. However, naturalists have hitherto been greatly mistaken as to the length of its existence. The great he-lion *Pompey*, which died in the year 1760, was known to have been in the tower for above seventy years; and one lately died there, which was brought from the river Gambia, that died above sixty-three. The lion, therefore, is a very long-lived animal: and very probably, in his native forests, his age exceeds even that of man himself.

In this animal all the passions, even of the most gentle kind, are in excess, but particularly the attachment of the female to her young. The lioness, though naturally less strong, less courageous, and less mischievous than the lion, becomes terrible when she has got young ones to provide for. She then makes her incursions with even more intrepidity than the lion himself; she throws herself indiscriminately among men and other animals; destroys without distinction; loads herself with the spoil, and brings it home reeking to her cubs, whom she accustoms betimes to cruelty and slaughter. She usually brings forth in the most retired and inaccessible places; and when she fears to have her retreat discovered, often hides her tracks by running back her ground, or by brushing them out with her tail. She sometimes also, when her apprehensions are great, transports them from one place to another; and, if obstructed, defends them with determined courage, and fights to the last.

The lion is chiefly an inhabitant of the torrid zone; and, as was said, is always most formidable there; nevertheless, he can subsist in more temperate climates; and there was a time when even the southern parts of Europe were infested by him. At present he is only found in Africa and the East Indies; in some of which countries he grows to an enormous height. The lion of Bildulgerid is said to be nearly five feet high, and between nine and ten feet from the tip of the nose to the insertion of the tail. We have in the tower, at present, one of above four feet high, that was brought from Morocco, which is the largest that for some time past has been seen in Europe. The ordinary size is between three and four feet; the female being, in all her dimensions, about one-third less than the male. There are no lions in America; the Puma, which has received the name of the American lion, is, when compared, a very contemptible animal, having neither the shape, the size, nor the mane of the lion; being known to be extremely cowardly, to climb trees for its prey, to subsist rather by its cunning than its courage, and to be inferior even to the animal that goes by the name of the American tiger. We ought not, therefore, to confound this little treacherous creature with the lion, which all the ancients have concurred in denominating the *king of beasts*, and which they have described as brave and merciful. "Indeed, the numerous accounts which they have given us of this animal's generosity and tenderness, show that there must be some foundation for the general belief of its good qualities; for mankind seldom err when they are all found to unite in the same story.[9] However, perhaps the caution of

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[9] Bell, a traveller in Asia, whose work was published in 1762, tells us that the sovereign of Persia, has, on the days of audience, two large lions chained on each side of the passages to the rooms of state, led there by keepers in chains of gold. This is a species of subjection of which we have seen very few other examples. We have seen, however, a lion (Nero) exhibited in a travelling menagerie (Wombwell's) that permitted all sorts of liberties to be taken with him, even by strangers. As many as a dozen persons have gone with safety into his den; and some have been rash enough, under the direction of the keeper, to put their heads within his jaws.

A few years ago there was a remarkable exhibition at Warwick, of two combats between lions and dogs. The tempers of the individual animals were very different. The one an exceedingly gentle creature, (Nero, whom we have just mentioned,) could not understand that the dogs seriously meant to attack him; and he bore their onset with the greatest patience. The other, of a fiercer and more unsubdued disposition (Wallace), would not endure the liberties of the fierce bull-dogs that were set upon him; and he very soon made fearful havoc amongst them. There are many well authenticated narratives of the affection of lions for individuals of the human species; and these might lead us to believe that the story was not altogether a fable, which is told by Aulus Gellius, of Androdus (the Androcles of Buffon), a Roman slave, being known and caressed in the Circus, by a lion who was destined to tear him in pieces; but who recollected that the unfortunate man had cured a wound in his leg, in his native deserts. That lions subdue their instincts to protect and foster weaker animals, particularly dogs, is well known. The old lion in the Tower, who spared a spaniel thrown into his cage to be devoured, and lived happily with it for several years, is still in the recollection of some persons. A similar circumstance is related by Jean Macquet, a traveller in the reign of Henry IV. of France, who had seen a dog at Morocco under the protection of several lions, to whom he had been thrown for a meal. Saint Pierre very prettily describes the lion of Versailles, who, in 1793, lived most happily with a dog:—"Their friendship," he says, "is one of the most touching exhibitions that Nature can offer to the speculations of a philosopher." M. Felix, the keeper of the animals at Paris, in the year 1808, brought two lions, a male and female, to the national menagerie. About the beginning of the following June, he was taken ill, and was unable to attend the lions. Another person, therefore, was under the necessity of performing this duty. The male, sad and solitary, remained from that moment constantly seated at the end of his cage, and refused to receive anything from the stranger whose presence was hateful to him, and whom he often menaced, by bellowing. The company even of the female seemed now to displease him; and he paid no attention to her. The uneasiness of the animal afforded a belief, that he was really ill; but no one dared to approach him. At length Felix recovered; and, with the intention to surprise the lion he crawled softly to the cage, and showed only his face between the bars. The lion in a moment made a bound, leaped against the bars, patted him with its paws, licked his face, and trembled with pleasure. The female also ran to him: but the lion drove her back, and seemed angry and, fearful that she should snatch any favours from

Aristophanes, the comic poet, is better followed in practice, who advises us to have nothing to do with this creature, but to let the lioness suckle her own whelps.[10]

THE TIGER.

"The ancients had a saying, *That as the peacock is the most beautiful among birds, so is the tiger among quadrupeds.*[11] In fact, no quadruped can be more beautiful than this animal: the glossy smoothness of its hair, which lies much smoother, and shines with greater brightness, than even that of the leopard, the extreme blackness of the streaks with which he is marked, and the bright yellow colour of the ground which they diversify, at once strike the beholder. To this beauty of colouring is added an extremely elegant form, much larger indeed than that of the leopard, but more slender, more delicate, and bespeaking the most extreme swiftness and agility. Unhappily, however, this animal's disposition is as mischievous as its form is admirable; as if Providence was willing to show the small value of beauty, by bestowing it on the most noxious of quadrupeds. We have at present one of these animals in the Tower, which to the view appears the most good-natured creature in the world; its physiognomy is far from fierce or angry; it has not the commanding stern countenance of the lion, but a gentle placid air; yet for all this, it is fierce and savage beyond measure; neither correction can terrify, nor indulgence can tame it."

The chief and most observable distinction in the tiger, and in which it differs from all others of the mottled kind, is in the shape of its colours, which run in streaks or bands in the same direction as his ribs, from the back down to the belly. The leopard, the panther, and the ounce, are all partly covered like this animal, but with this difference, that their colours are broken in spots all over the body; whereas in the tiger they stretch lengthwise, and there is scarce a round spot to be found on his skin. Besides this, there are other observable distinctions: the tiger is much larger, and often found bigger even than the lion himself; it is much slenderer also in proportion to its size, its legs shorter, and its neck and body longer. In short, of all other animals, it most resembles the cat in shape; and if we conceive the latter magnified to a very great degree, we shall have a tolerable idea of the former.

In classing carnivorous animals, we may place the lion foremost;[12] and immediately after him follows the tiger, which seems to partake of all the noxious qualities of the lion, without sharing any of his good ones. To pride, courage, and strength, the lion joins greatness, clemency, and generosity; but the tiger is fierce without provocation, and cruel without necessity. The lion seldom ravages except when excited by hunger; the tiger, on the contrary, though glutted with slaughter, is not satisfied, still continues the carnage, and seems to have its courage only inflamed by not finding resistance. In falling in among a flock or herd, it gives no quarter, but levels all with indiscriminate cruelty, and scarcely finds time to appease its appetite, while intent upon satisfying the malignity of its nature. It thus becomes the scourge of the country where it is found; it fears neither the threats nor the opposition of mankind; the beasts, both wild and tame, fall equally a sacrifice to its insatiable fury; the young elephant and the rhinoceros become equally its prey, and it not unfrequently ventures to attack even the lion himself.[13]

Felix, a quarrel was about to take place; but Felix entered into the cage to pacify them. He caressed them by turns; and was afterwards frequently seen between them. He had so great a command over these animals, that whenever he wished them to separate and retire to their cages, he had only to give the order. When he had a desire that they should lie down, and show strangers their paws or throats, on the least sign they would lie on their backs, hold up their paws, one after another, open their throats; and, as a recompense, obtain the favour of licking his hand. These animals were of the Asiatic breed, and, at the time above-mentioned, were five years and a half old. In the beginning of last century, there was in the menagerie at Cassel, a lion that showed an astonishing degree of tameness towards the woman that had care of him. This went so far, that the woman, in order to amuse the company that came to see the animal, would often rashly place not only her hand, but even her head, between his tremendous jaws. She had often performed this experiment, without suffering any injury. Upon one occasion, however, having introduced her head as usual into the lion's mouth, the animal made a sudden snap, and killed her on the spot. Undoubtedly, this catastrophe was unintentional on the part of the lion; for, probably, at the fatal moment, the hair of the woman's head had irritated the lion's throat, and compelled him to sneeze or cough. At least, this supposition seems to be confirmed by what followed; for, as soon as the lion perceived that he had killed his attendant, the good tempered, grateful animal exhibited signs of the deepest melancholy, laid himself down by the side of the dead body, which he would not suffer to be taken from him, refused to take any food, and in a few days pined to death.

[10] Ου χρη λεοντος σκυμνον εν πολει τρεφειν.

[11] Tantum autem præstat pulchritudine tigris inter alias feras quantum inter volucres pavo.

[12] The remainder of this description is taken from Mr. Buffon, except where marked with commas.

[13] In December 1830, a singular fight took place between two tigers and a lion in the tower of London. As the man whose duty it was to clean the cages of the wild beasts at the tower was in the execution of that office, he inadvertently raised a door in the upper tier of cells, which separated the den of a huge lion from one in which there were a Bengal royal tiger and tigress. At sight of each other the eyes of the animals sparkled with rage. The lion instantly erected his mane, and, with a tremendous roar, sprung at the tiger. The tiger was equally eager for the combat, and, in a paroxysm of fury, flew at his assailant, whilst the tigress fiercely seconded her mate. The roaring and yelling of the combatants resounded through the yards, and excited in all the various animals the most lively demonstra

Happily for the rest of nature, that this animal is not common, and that the species is chiefly confined to the warmest provinces of the East. The tiger is found in Malabar, in Siam, in Bengal, and in all the countries which are inhabited by the elephant or the rhinoceros. Some even pretend that it has a friendship for, and often accompanies the latter, in order to devour its excrements, which serve it as a purge. Be this as it will, there is no doubt but that they are often seen together at the sides of lakes and rivers; where they are probably both compelled to go by the thirst which, in that torrid climate, they must very often endure. It is likely enough also that they seldom make war upon each other, the rhinoceros being a peaceable animal, and the tiger knowing its strength too well to venture the engagement. It is still more likely that the tiger finds this a very convenient situation, since it can there surprise a greater number of animals, which are compelled thither from the same motives. In fact, it is generally known to lurk near such places where it has an opportunity of choosing its prey, or rather of multiplying its massacres. When it has killed one, it often goes to destroy others, swallowing their blood down at large draughts, and seeming rather glutted than satiated with its abundance.

However, when it has killed a large animal, such as a horse or a buffalo, it immediately begins to devour it on the spot, fearing to be disturbed. In order to feast at its ease, it carries off its prey to the forest, dragging it along with such ease, that the swiftness of its motion seems scarcely retarded by the enormous load it sustains. From this alone we may judge of its strength; but to have a more just idea of this particular, let us stop a moment to consider the dimensions of this most formidable creature. Some travellers have compared it for size to a horse, and others to a buffalo, while others have contented themselves with saying, that it is much larger than a lion. We have recent accounts of this animal's magnitude, that deserve the utmost confidence. Mr. Buffon has been assured by one of his friends, that he saw a tiger in the East Indies fifteen feet long. "Supposing that he means including the tail, this animal, allowing four feet for that, must have been eleven feet from the tip of the nose to the insertion of the tail. Indeed, that which is now in the Tower is not so large, being, as well as I could measure, six feet from the tip to the insertion, and the tail was three feet more. Like all the rest of its kind, its motions are irregular and desultory; it bounds rather than runs; and, like them, rather chooses to take its prey by surprise, than to be at the trouble of hunting it down." How large a leap it can take at once we may easily judge, by comparing what it might do, to what we see so small an animal as the cat actually perform. The cat can leap several feet at a bound; and the tiger, who is ten times as long, can, no doubt, spring proportionably.

"The tiger is the only animal whose spirit seems untameable. Neither force nor constraint, neither violence nor flattery, can prevail in the least on its stubborn nature. The caresses of the keeper have no influence on its heart of iron: and time, instead of mollifying its disposition, only serves to increase its fierceness and malignity.[14] The tiger snaps at the hand that feeds it, as well as that by which it is chastised; every object seems considered only as its proper prey, which it devours with a look; and, although confined by bars and chains, still makes fruitless efforts, as if to show its malignity when incapable of exerting its force."

To give a still more complete idea of the strength of this terrible creature, we shall quote a passage from Father Tachard, who was an eyewitness of a combat between a tiger and three elephants at Siam. For this purpose the king ordered a lofty pallisade to be built of bamboo cane, about a hundred feet square; and in the midst of this were three elephants appointed for combating the tiger. Their heads and a part of their trunk were covered with a kind of armour, like a mask, which defended that part from the assaults of the fierce animal with which they were to engage. As soon, says this author, as we were arrived at the place, a tiger was brought forth from its den, of a size much larger than we

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tions of fear and rage. The timid tribes shivered with dread, and ran round their cages shrieking with terror, whilst the other lions and tigers, with the bears, leopards, panthers, wolves, and hyænas, flew round their dens, shaking the bars with their utmost strength, and uttering the most terrific cries. The lion fought most bravely, but was evidently overmatched, having to contend with two adversaries not more than a year from the woods, whilst he had been upwards of seven years in confinement Still the battle raged with doubtful success, until the tiger seized the lion by the throat, and flung him on the back, when, after rolling over each other several times the exasperated tigress pinned her enemy against the veranda. In that situation the prostrate lord of the forest still struggled with an indomitable spirit, roaring with agony and rage. By this time, however, some iron rods had been heated, the red-hot ends of which were now applied to the mouths and nostrils of the infuriated tigers, who were by this means forced to relinquish their grasp; but no sooner was the separation effected than the lion and the tiger seized in their mouths—the one the upper, the other the lower jaw of his antagonist, biting and tugging at each other with deadly fury. So excited was their animosity that it was with the greatest difficulty, by the insertion into their nostrils of the glowing iron, they could be disengaged, and the lion driven back to his cell, the door of which was instantly closed upon him. The tiger in the last onset lost one of his tusks, but the poor lion was very severely punished. The battle lasted full half-an-hour.—Ed.

[14] Yet there are anecdotes tending to show that this fierce creature is not always unconscious of the impulses of gratitude or affection. See Supplementary Note A, p. 371.—Ed.

had ever seen before. It was not at first let loose, but held with cords, so that one of the elephants approaching, gave it three or four terrible blows with its trunk on the back, with such force that the tiger was for some time stunned, and lay without motion, as if it had been dead. However, as soon as it was let loose, and at full liberty, although the first blows had greatly abated its fury, it made at the elephant with a loud shriek, and aimed at seizing his trunk. But the elephant, wrinkling it up with great dexterity, received the tiger on his great teeth, and tossed it up into the air. This so discouraged the furious animal, that it no more ventured to approach the elephant, but made several circuits round the pallisade, often attempting to fly at the spectators. Shortly after, three elephants were sent against it, and they continued to strike it so terribly with their trunks, that it once more lay for dead; and they would certainly have killed it, had not there been a stop put to the combat.

From this account we may readily judge of the strength of this animal, which, although reduced to captivity, and held by cords; though first disabled, and set alone against three; yet ventured to continue the engagement, and even that against animals covered and protected from its fury.

"Captain Hamilton informs us, that in the Sundah Rajah's dominions there are three sorts of tigers in the woods, and that the smallest are the fiercest. This is not above two feet high, appears to be extremely cunning, and delights in human flesh. The second kind is about three feet high, and hunts deer and wild hogs, besides the little animal which has been already described under the name of the *Chevrotain*, or *Guinea deer*. The tiger of the largest sort is above three feet and a half high; but, although endued with greater powers, is by no means so rapacious as either of the former. This formidable animal, which is called the *royal tiger*, (one of which we have at present in the Tower,) does not seem so ravenous nor so dangerous, and is even more cowardly.[15] A peasant in that country, as this traveller informs us, had a buffalo fallen into a quagmire, and while he went for assistance, there came a large tiger, that with its single strength drew forth the animal, which the united force of many men could not effect. When the people returned to the place, the first object they beheld was the tiger, who had thrown the buffalo over its shoulder, as a fox does a goose, and was carrying it away, with the feet upward, towards its den; however, as soon as it saw the men, it let fall its prey, and instantly fled to the woods; but it had previously killed the buffalo, and sucked its blood; and, no doubt, the people were very well satisfied with its retreat. It may be observed, that some East Indian buffaloes weigh above a thousand pounds, which is twice as heavy as the ordinary run of our black cattle, so that from hence we may form a conception of the enormous strength of this rapacious animal, that could thus run off with a weight at least twice as great as that of itself.

"Were this animal as common as the panther, or even as the lion himself, thus furnished as it is with the power to destroy, and the appetite for slaughter, the country would be uninhabitable where it resides. But luckily the species is extremely scarce; and has been so since the earliest accounts we have had of the tiger. About the times of Augustus, we are assured by Pliny,[16] that when panthers were brought to Rome by hundreds, a single tiger was considered as an extraordinary sight; and he tells us, that the emperor Claudius was able to procure four only; which shows how difficultly they were procured. The incredible fierceness of this animal may be, in some measure, the cause of the scarcity which was then at Rome, since it was the opinion of Varro, that the tiger was never taken alive:[17] but its being a native only of the East Indies, and that particularly of the warmer regions, it is not to be wondered that the species should be so few."

We may, therefore, consider the species of the true streaked tiger as one of the scarcest of animals, and much less diffused than that of the lion. As to the number of its young, we have no certain accounts; however, it is said, that it brings forth four or five at a time. Although furious at all times, the female, upon this occasion, exceeds her usual rapacity; and, if her young are taken from her, she pursues the spoiler with incredible rage; he, to save a part, is contented to lose a part, and drops one of her cubs, with which she immediately returns to her den, and again pursues him; he then drops another, and by the time she has returned with that, he generally escapes with the remainder. If she loses her young entirely, she then becomes desperate, boldly approaches even the towns themselves, and commits incredible slaughter. The tiger expresses its resentment in the same manner as the lion; it moves the muscles and skin of its face, shows its teeth, and shrieks in the most frightful manner. Its note is very different from that of the lion; being rather a scream than a roar: and the ancients expressed it very well, when they said, that *tigrides indomitæ rancant rugiuntque leones.*

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[15] The *royal* or *Bengal tiger* is easily distinguished from all other species by his transverse dark stripes. Compared with the lion, he is thinner and lighter, and has the head rounder. The upper part of the body is yellow and the under part white. The whole internal face of the ears, and a spot on the external surface round and over the eyes, the end of the muzzle, cheeks, throat, neck, chest, belly, and internal sides of the limbs, are white; and the tail is annulated with black on a whitish-yellow ground. This animal is the scourge of Asia and the Indian islands. Equal to the lion in stature, though generally inferior in strength, it wants not courage and ferocity to attack that animal; but although the combat is sometimes furious, it generally falls a victim to its temerity in so doing, unless some disparity of age or other circumstance should bring the strength and power of the two animals more to a level. Its swiftness and strength enable it to seize a man while on horseback, and to drag, or rather to carry him in its mouth by bounds and leaps into a jungle or forest, in spite of all efforts to prevent it, short of musket-balls: indeed, the weight of a man, or even of a more ponderous animal, in its mouth, does not appear to incommode or delay the ordinary swiftness of the beast. See also Supplementary Note A, p. 371.—Ed.

[16] Plin. Hist. Nat. lib. viii. c. 17.

[17] Tigris vivus capi adhuc non potuit. Var. de. Ling. Lat.

The skin of these animals is much esteemed all over the East, particularly in China; the mandarins cover their seats of justice in the public places with it, and convert it into coverings for cushions in winter. In Europe, these skins, though but seldom to be met with, are of no great value, those of the panther and the leopard being held in much greater estimation. This is all the little benefit we derive from this dreadful animal, of which so many falsehoods have been reported; as, that its sweat was poisonous, and the hair of its whiskers more dangerous than an envenomed arrow. But the real mischiefs which the tiger occasions while living are sufficient, without giving imaginary ones to the parts of its body when dead. In fact, the Indians sometimes eat its flesh, and find it neither disagreeable nor unwholesome.

There is an animal of America, which is usually called the *red tiger*, but Mr. Buffon calls it the *cougar*, which, no doubt, is very different from the tiger of the East.[18] Some, however, have thought proper to rank both together, and I will take leave to follow their example, merely because the cougar is more like a tiger in every thing, except the colour, than any other animal I know, having the head, the body, and the neck, shaped very much in the same manner. Of these slight differences, words would give but a very faint idea; it will be, therefore, sufficient to observe, that they are both equally slender, and are smaller where the neck joins the head, than others of the panther kind. There is one at present in the Tower; and it seemed to me, as I could see it through the bars, that were it properly streaked and coloured, it would in all things resemble a small tiger. It is, however, of a very different colour, being of a deep brown, and the tail very long and pointed. It is rather darker on the back; under the chin it is a little whitish, as also on the lower part of the belly.

Of all the American animals, this is the most formidable and mischievous,—even their pretended lion not excepted; it is said there are several sorts of them; and, as well as I can remember, I have seen one or two here in England, both differing from the present in size and conformation. It is, indeed, a vain endeavour to attempt to describe all the less obvious varieties in the cat kind. If we examine them minutely, we shall find the differences multiply upon us so much, that, instead of a history, we shall only be paid with a catalogue of distinctions. From such of them as I have seen, within these last six years, I think I could add two animals of this species, that have not been hitherto described, and with the names of which he that showed them was utterly unacquainted. But it is a poor ambition, that of being eager to find out new distinctions, or adding one noxious animal more, to a list that is already sufficiently numerous.[19] Were the knowing a new variety to open an unknown history, or in the least to extend our knowledge, the inquiry would be then worth pursuing; but what signifies mentioning some trifling difference, and from thence becoming authors of a new name, when the difference might have originally proceeded either from climate, soil, or indiscriminate copulation.

The cougars are extremely common in South America; and, where the towns border upon the forest, these make frequent incursions by night into the midst of the streets, carrying off fowls, dogs, and other domestic creatures. They are, however, but weak and contemptible, compared to the great tiger, being found unable to cope with a single man. The Negroes and Indians are very dexterous in encountering them; and some, even for the sake of their skins, seek them in their retreats. The arms in this combat, seemingly so dangerous, are only a lance of two or three yards long, made of heavy wood, with the point hardened in the fire; and a kind of scimetar, of about three-quarters of a yard in length. Thus armed, they wait till the tiger makes an assault against the left hand, which holds the lance, and is wrapped up in a short cloak of baize. Sometimes the animal, aware of the danger, seems to decline the combat; but then its antagonist provokes it with a slight touch of the lance, in order, while he is defending himself, to strike a sure blow. As soon, therefore, as the creature feels the lance, it grasps it with one of its paws, and with the other strikes at the arm which holds it. Then it is that the person nimbly aims a blow with his scimetar, which he kept concealed, with the other hand, and hamstrings the creature, which immediately draws back enraged, but instantly returns to the charge. But then receiving another stroke, it is totally deprived of the power of motion; and the combatant, killing it at his leisure, strips the skin, cuts off the head, and returns to his companions, displaying these as the trophies of his victory.

This animal, as we are assured, is often more successful against the crocodile; and it is the only quadruped in that part of the world that is not afraid of the engagement. It must be no unpleasant sight to observe, from a place of safety, this extraordinary combat, between animals so terrible and obnoxious to man. Such as have seen it, describe it in the following manner. When the tiger, impelled by thirst, that seems continually to consume it, comes down to the river side to drink, the crocodile, which makes no distinction in its prey, lifts its head above water to seize it; the tiger, not less rapacious than the other, and unacquainted with the force of the enemy, boldly ventures to seize it, and plunges its claws into the eyes of the crocodile, which is the only vulnerable part of its body: upon this the crocodile instantly dives under water, and the tiger goes down with him, for it will sooner die than let go its hold. In this manner the combat continues for some time, until the tiger is drowned, or escapes, as is sometimes the case, from its disabled enemy.

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[18] See Supplementary Note B, p. 373.

[19] Our author here speaks rather slightingly of the minute researches of the naturalist. The perplexing varieties of the cat kind seem to have driven him to unjustly disavow the utility of a pursuit, because its complete success was unattainable.—ED.

These animals are common in Guiana.[20] They were formerly seen swimming over, in great numbers, into the island of Cayenne, to attack and ravage the flocks and herds of the inhabitants. In the beginning they were a terrible scourge to the infant colony; but by degrees they were repulsed and destroyed, and are now seen no longer at that place. They are found in Brazil, in Paraguay, in the country of the Amazons, and in several other parts of South America. They often climb trees in quest of prey, or to avoid their pursuers. They are deterred by fire, like all other animals of the cat kind; or, more properly speaking, they seldom venture near those places where they see it kindled, as they are always sure of their enemies being near, and their nocturnal eyes are dazzled by the brightness of the blaze. From the description of this animal, one would be hardly led to suppose that its flesh was good for food; and yet we have several accounts which allege the fact, some asserting it to be superior even to mutton: however, what Monsieur des Marchais observes, is most likely to be true; namely, that the most valuable part of this animal is its skin, and that its flesh is but indifferent eating, being generally lean, and usually having a strong fumet.

Note A.—*Habits and Anecdotes of the Tiger.*

Mr. Marsden informs us, that the tigers in Sumatra prove to the inhabitants there, both in their journeys and even their domestic occupations, most fatal and destructive enemies. The number of people usually slain by these rapacious tyrants of the woods is almost incredible. Whole villages are sometimes depopulated by them. Yet from a superstitious prejudice, it is with difficulty they are prevailed upon, by a large reward which the India Company offers, to use methods of destroying them, till they have sustained some particular injury in their own family or kindred, and their ideas of fatalism contribute to render them insensible to the risk. Their traps, of which they can make a variety, are very ingeniously contrived. Sometimes they are in the nature of strong cages, with falling doors, into which the beast is enticed by a goat or dog enclosed as a bait. Sometimes they manage so that a large beam is made to fall in a groove across the tiger's back; at other times it is noosed about the loins with strong rattans, or led to ascend a plank nearly balanced, which, turning when it has passed the centre, lets the animal fall upon sharp stakes prepared below. Instances have occurred of a tiger being caught by one of the former modes, which had many marks in its body of the partial success of this last expedient. The tigers of Sumatra are very large and strong. They are said to break the leg of a horse or buffalo with a stroke of the fore-paw, and the largest prey they kill is, without difficulty, dragged by them into the woods. This they usually perform on the second night, being supposed on the first to gratify themselves with sucking the blood only. Time is by this delay afforded to prepare for their destruction; and to the methods already enumerated, besides shooting them, may be added that of placing a vessel of water strongly impregnated with arsenic near the carcass, which is fastened to a tree, to prevent its being carried off. The tiger having satiated itself with the flesh, is prompted to assuage its thirst with the tempting liquor at hand, and perishes in the indulgence.

Buffon's assertion that the nature of the tiger is perfectly incapable of improvement, is rather too strong, as many instances have evinced since the time that Buffon wrote. A full grown tiger was lately in the possession of some of the natives at Madras, who exhibited it held merely by a chain; it was indeed kept muzzled, except when it was allowed (which was occasionally done) to make an attack on some animal, in order to exhibit the mode of its manœuvring in quest of prey. For the purpose of this exhibition, a sheep in general was fastened by a cord to a stake, and the tiger being brought in sight of it, immediately crouched, and moving almost on its belly, but slowly, and cautiously, till within the distance of a spring from the animal, leapt upon and struck it down almost instantly dead, seizing it at the same moment by the throat with its teeth; the tiger would then roll round on its back, holding the sheep on its breast, and fixing the hind claws near the throat of the animal, would kick or push them suddenly backwards, and tear it open in an instant. Notwithstanding, however, the natural ferocity of these animals in general, the individual in question was so far in subjection, that while one keeper held its chain during this bloody exhibition, another was enabled to get the carcass of the sheep away by throwing down a piece of meat previously ready for the purpose.

A beautiful tiger brought over from Bengal in the year 1791, during his voyage to England exhibited the most gentle disposition, and seemed to be as harmless and playful as a kitten. It sometimes permitted two or three of the sailors to repose their heads on its body as on a pillow. It also frequently climbed about the vessel in a most diverting manner; and on being one day severely beaten by the carpenter for stealing a piece of beef, it submitted to the chastisement with all the patience of a dog.

In the year 1801, one day after this tiger had been fed, his keeper put a rough, black terrier puppy into his den. The beast suffered it to remain uninjured, and soon afterwards became so attached to it, as to appear restless whenever the animal was taken away to be fed, and to welcome its return by gently licking over every part of its body. In one or two instances the terrier was left in the den during the time the tiger had his food; and sometimes ventured to eat along with him, but seldom without his appearing dissatisfied with the liberty. This terrier, after a residence with the tiger of several months, was removed to make way for a little pug bitch, which was previously shut up for three or four days among the straw of the tiger's bed, to take off, if possible, any smell that might have proved offensive. The exchange was made soon after the animals had been fed; the tiger seemed perfectly contented with his new companion, and immediately began to lick it as he had before done the terrier. It seemed at first in considerable alarm with so formidable an inmate, but in the course of the day became reconciled to its situation. This diminutive creature would frequently play with the tiger, bark at him, and even bite him by the foot and mouth, without exciting the least displeasure or resentment. During the time the bitch was in the habit of daily visiting the tiger, she happened to be with young, and at the time of parturition, was necessarily absent two or three whole days, during which time the tiger seemed agitated and uneasy, as he was afterwards whenever she happened to be detained a greater while than usual in feeding her young ones. She died about five weeks after this time, supposed to have been trodden upon by some person who came to see the animals; and many days elapsed before the tiger became reconciled to her absence. The ship-carpenter who came over with the tiger, after an absence of more than two years, came to the Tower to see him.—The animal instantly recognised his former acquaintance, rubbed himself backward and forward against the grating of his den, and appeared highly delighted. Notwithstanding the urgent request of the keeper, that he would not rashly expose himself to danger, the man begged so earnestly to be let into the den, that he was at last suffered to enter. The emotions of the animal seemed roused in the most grateful manner. He rubbed against him, licked his hands, fawned upon him like a cat, and in no respect attempted to injure him. The man remained in the den from two to three hours; and he at last began to imagine there would be some difficulty in getting out alone. Such was the affection of the animal towards his former friend, and so close did he keep to his person, as to render his escape almost impracticable. With some care, however, he got the tiger beyond the partition of the two dens, and the keeper watching his opportunity, dexterously closed the slide, and thus separated them.

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[20] Buffon, vol. xix. p. 22.

In 1843, a sailor who had been strolling round Wombwell's menagerie, loitering here and there to admire and identify some of the animals with those he had seen in far distant climes, was attracted by the strange noise made by a tiger, who seemed irritated beyond endurance. Jack, somewhat alarmed, sought the keeper to inquire the cause of so singular a display of feeling, which, he remarked, became more boisterous the nearer he approached the animal; the keeper replied, that the behaviour of the tiger indicated either that he was vastly pleased or annoyed; upon this the sailor again approached the den, and after gazing at the tiger for a few minutes—during which the animal became frantic with seeming rage, lashing his tail against his sides and giving utterance to the most frightful bellowings—discovered the tiger to be the same animal brought to England under the especial care of the weather-beaten tar. It now became Jack's turn to be delighted, as it appears the tiger was, in thus recognising its old friend, and after making repeated applications to be permitted to enter the den for the purpose, as he said, of "shaking a fist" with the beautiful animal, he was suffered so to do; the iron door was opened, and in jumped Jack to the delight of himself and striped friend, and the astonishment of the lookers-on. The affection of the animal was now shown, by caressing and licking the pleased sailor, whom he seemed to welcome with the heartiest satisfaction, and when the honest tar left the den, the anguish of the poor animal appeared almost insupportable.

An experiment was tried some years ago at Edinburgh, by putting a bitch big with young into the den of a tigress. It was naturally expected that the defenceless creature would have been instantly devoured, by an animal so ferocious as a tigress. The latter, however, appeared wholly regardless of her new companion, and not only suffered her to remain uninjured, but even to feed with her, and occasionally to repose on her ample back. In a short time the bitch produced five puppies, which lay securely in a corner of the den, while the tigress evinced, by stepping carefully over them, and by other signs, that she held them unworthy of notice, or, at least, that she had no desire to molest them. This curious circumstance was witnessed by many spectators. After some time, three of the puppies unfortunately strayed from the den, and were devoured by a lioness, and the two others are supposed to have been carried off by some of the visitors who crowded to see them. The bitch, however, continued to live still in perfect amity with her formidable companion.—Mr. White, in his 'Voyage to Cochin China,' relates the following anecdote. "In Saigon, where dogs are 'dog cheap,' we used to give the tigress one every day. They were thrown alive into her cage, when, after playing with her victim for a while, as a cat does with a mouse, her eyes would begin to glisten, and her tail to vibrate, which were the immediate precursors of death to the devoted little prisoner, which was invariably seized by the back of the neck, the incisors of the sanguinary beast perforating the jugular arteries, while she would traverse the cage, which she lashed with her tail, and suck the blood of her prey, which hung suspended from her mouth.—One day a puppy, not at all remarkable, or distinguishable in appearance from the common herd, was thrown in, who immediately, on perceiving his situation, set up a dismal yell, and attacked the tigress with great fury, snapping at her nose, from which he drew some blood. The tigress appeared to be amused with the puny rage of the puppy, and with as good-humoured an expression of countenance as so ferocious an animal could be supposed to assume, she affected to treat it all as play; and sometimes spreading herself at full length on her side, at others, crouching in the manner of the fabled sphynx, she would ward off with her paw the incensed little animal, till he was finally exhausted. She then proceeded to caress him, endeavouring by many little arts to inspire him with confidence, in which she finally succeeded, and in a short time they lay down together and slept. From this time they were inseparable; the tigress appearing to feel for the puppy all the solicitude of a mother, and the dog, in return, treating her with the greatest affection; and a small aperture was left open in the cage, by which he had free ingress and egress. Experiments were subsequently made, by presenting a strange dog at the bars of the cage, when the tigress would manifest great eagerness to get at it; her adopted child was then thrown in, on which she would eagerly pounce; but immediately discovering the cheat, she would caress it with great tenderness. The natives made several unsuccessful attempts to steal this dog from us."

Tigers' skins vary as to the number of stripes and brightness of the colours, which latter abates in some degree when the animal is living under restraint, and much more when a skin is dried and prepared for commercial purposes.

The tigress is pregnant about fourteen weeks, produces four or five at a time, and has been known to breed when confined. When first born, the young do not exceed the size of a kitten about three months old. They are of a pale-gray colour with obscure dusky transverse bars, like those proper to the lion of the same age. The course of reproduction of the larger felinæ has, of late years, been frequently open to observation in the menageries, and one cannot but feel some surprise that the breeding these animals in a state of confinement should be comparatively matter of modern experiment only. We have now not only instances of these animals breeding in the ordinary manner, but we have instances of varieties so distant as to be inserted in zoological catalogues as specifically different, which have reproduced. We may advert particularly to the reproduction between the African lion and Asiatic tigress in Mr. Atkin's Menagerie. Between these two species, three cubs were littered at Windsor in 1824, all of which were exhibited under the name of lion-tigers

NOTE B.—*The Jaguar and the Puma.*

Among the varieties of the tiger are the Nebulose or Clouded tiger, and the jaguar or American tiger, and the puma or American lion.

The jaguar is very like the panther or leopard of the Old World; but the spots or rings of the former are larger and more oblong, particularly down the back; and those near the dorsal line have a central black dot, which is never seen in the panther or leopard. The head is rounder than in the panther; the animal altogether stouter and stronger; and the tail never reaches farther than to the ground, which last is, perhaps, the most obvious difference between them. There is also a black variety found in the forests on the frontiers of Brazil, which has the same spots and marks as the others, on a ground of a somewhat browner black; so that they are visible only on close examination, and by viewing the skin when inclining at a certain angle from the direction of the light. The black variety, however, is extremely rare. One is also mentioned by Azara, perfectly white, with the spots indicated by a more opaque appearance; but this peculiarity was possibly the effect of albinism.

The jaguars are solitary animals, or are met with only in pairs; they inhabit thick forests, especially in the neighbourhood of great rivers; and if they be driven by their wants to seek for sustenance in the cultivated country, they generally do so by night. It is said they will stand in the water, out of the stream, and drop their saliva, which, floating on the surface, draws the fish after it within their reach, when they seize them with the paw, and throw them on shore for food. They will attack cows, and even bulls of four years old, but horses seem to be their favourite prey. They destroy the larger animals by leaping on their back; and placing one paw on the head, and another on the muzzle, they contrive to break the neck of their victim in a moment. Having thus deprived it of life, they will drag the carcass, by means of their teeth, a very considerable distance, to their retreat, from which their great strength may, in some measure, be estimated.

The jaguar is hunted with a number of dogs, which, although they have no chance of destroying it themselves, drive the animal into a tree, provided it can find one a little inclining, or else into some hole. In the first case, the hunters kill it with fire-arms or lances; and in the second, some of the natives are occasionally found hardy enough to approach it with the left arm covered with a sheepskin, and to spear it with the other; a temerity which is frequently followed with fatal consequences to the hunter. The traveller, who is unfortunate enough to meet this formidable beast, especially if it be after sunset, has but little time for consideration. Should it be urged to attack by the cravings of appetite, it is not any noise, or a fire-brand, that will save him. Scarcely any thing but the celerity of a musket-ball will anticipate its murderous purpose. The aim must be quick and steady: and life or death depends on the result. Many parts of South America which were once grievously pestured with jaguars, are now almost freed from them, or are only occasionally troubled with their destructive incursions.

Nearly approaching to the jaguar in size and form, but obviously distinguished from him at the first glance, by the total absence of spots, the puma, couguar, or, as he was once called, the American lion, occupies the second place among the cats of the New World, over nearly the whole of which he was formerly spread, from Canada and the United States in the North, to the very extremity of Patagonia in the South. From a large portion of this immense expanse of country he appears, however, to have been of late years in a great measure, if not entirely, rooted out; and it is seldom that he is now heard of in the vicinity of that civilization, which involves, as a necessary consequence, either the complete extinction, or, at least, the gradual diminution and dispersion to more secure and sheltered habitations, of all the more savage and obnoxious beasts. For his title of the American lion he was, in a great degree, indebted to an absurd notion on the part of the early colonists, which was even shared by many naturalists, that he was, in reality, neither more nor less than a degenerate variety of that far more noble animal. This opinion has, however, long since given way before the prevalence of sounder views; and he is now universally recognised as forming a species clearly distinguishable from every other, by a combination of characters which it is impossible to mistake.

Almost the only striking point of resemblance between him and the lion consists in the uniform sameness of his colour, which on the upper parts of his body is of a bright silvery fawn, the tawny hairs being terminated by whitish tips: beneath and on the inside of the limbs he is nearly white, and more completely so on the throat, chin, and upper lip. The head has an irregular mixture of black and gray, the outside of the ears, especially at the base, the sides of the muzzle from which the whiskers take their origin, and the extremity of the tail, are black. The latter is not terminated, as in the lion, by a brush of hair; neither has the puma any vestige of a mane. His length from the tip of the nose to the root of the tail is commonly about four feet, and his tail measures above half as much more; being just sufficiently long to suffer its extremity to trail upon the ground. His head is remarkably small and rounded, with a broad and somewhat obtuse muzzle; and his body is proportionably more slender and less elevated than that of the lion. His young, like those of the latter animal, have a peculiar livery, consisting in spots of a darker shade than the rest of their fur, scattered over every part of the body, but only visible in a particular light, and disappearing entirely at the adult age. There is no difference whatever in colour between the sexes, the fur of the female being in every respect similar to that of the male: in size the latter is superior to his mate; and his head, a part which in the female is disproportionately small, corresponds better with the general form of his body.

More circumspect, or rather more cowardly, than any of the larger species of his cautious tribe, he is, notwithstanding his much greater magnitude, scarcely more dangerous than the common wild cat, preying only upon the smaller species of animals, seldom venturing to attack any living creature of greater size or courage than a sheep, and flying from the face of man with more than usual terror. But this cowardice is also, in a state of nature, connected with a degree of ferocity, fully equal to that which is developed in the most savage and blood-thirsty of his fellow-cats. Unlike the jaguar, which generally contents itself with a single victim, the puma, if he should happen to find himself undisturbed in the midst of a flock of sheep, deserted by their guardians and left entirely at his mercy, is said never to spare, but to destroy every individual that he can reach, for the purpose of sucking its blood. He differs also from the jaguar in his habit of frequenting the open plain rather than the forest and the river, in and near which the latter usually takes his secret and destructive stand. Hence he is more exposed to the pursuit of the skilful thrower of the lasso, from whom, as his swiftness is by no means great, and his timidity excessive, he rarely escapes.

In captivity the puma readily becomes tame, and may even be rendered docile and obedient. His manners closely resemble those of the domestic cat. Like it he is extremely fond of being noticed, raises his back and stretches his limbs beneath the hand that caresses him, and expresses his pleasure by the same quiet and complacent purring. They soon become attached to those with whom they are familiar; and numerous instances might be mentioned in which they have been suffered to roam almost at large without any injurious results. Mr. Kean, the tragedian, possessed an animal of this species so tame as to follow him about almost like a dog, and to be frequently introduced into his drawing-room, when filled with company. The following story shows the gratitude and attachment of which a puma is capable:—A dreadful famine raged at Buenos Ayres, during the government of Don Diego de Mendoza, in Paraguay; yet Don Diego, afraid to give the Indians a habit of spilling Spanish blood, forbade the inhabitants, on pain of death, to go into the fields, in search of relief, placing soldiers at all the outlets to the country, with orders to fire upon those who should attempt to transgress his orders. A woman, however, called Maldonata, was artful enough to elude the vigilance of the guards, and escape. After wandering about the country for a long time, she sought shelter in a cavern; but she had scarcely entered it when she became dreadfully alarmed, by espying a female puma. She was, however, soon quieted, by the animal approaching and caressing her. The poor brute was in a state, in which assistance is of the most service, and when rendered, is gratefully remembered, even by the brute creation. Of this, the puma gave her benefactress the most sensible proofs. She never returned from searching after her daily subsistence, without laying a portion of it at the feet of Maldonata, until, her whelps being strong enough to walk abroad, she took them with her, and never returned.

THE PANTHER AND THE LEOPARD.

We have hitherto found no great difficulty in distinguishing one animal from another, each carrying its own peculiar marks, which, in some measure, serve to separate it from all the rest. But it is otherwise when we come to those of the cat kind, that fill up the chasm between the tiger and the cat. The spots with which their skins are diversified, are so various, and their size so equivocal, that it is no easy matter to distinguish the species, particularly as we have little else but the spots and the size to guide us in making the distinction. If we regard the figure and diversity of the spots, we shall find many varieties not taken notice of by any naturalist; if we are led by the size, we shall find an imperceptible gradation from the cat to the tiger. It would be vain, therefore, to make as many varieties in these animals as we see differences in spots or nature; it will be sufficient to seize the most general distinctions, and leave the rest to such as are fond of more minute disquisitions.

Of all this tribe, whose skins are so beautifully spotted, and whose natures are so mischievous, the panther may be considered as the foremost. This animal has been by many naturalists mistaken for the tiger; and in fact, it approaches next to it in size, fierceness, and beauty. It is distinguished, however, by one obvious and leading character; that of being spotted, not streaked; for, in this particular, the tiger differs from the panther, the leopard, and almost all the inferior ranks of this mischievous family.

This animal, which Mr. Buffon calls simply the *panther;* Linnæus, the *pard;* Gessner, the *pardalis;* and the modern Latins, the *leopardus:* this animal, I say, which goes by too many names, and which the English have indiscriminately called by the name of the panther or the leopard, may be considered as the largest of the kind, and is spotted in a manner somewhat different from those that are smaller. As those spots, however, make the principal difference between it and the lesser animals, which it otherwise resembles in shape, size, disposition, and beauty, I will first show these slight distinctions, and mention the names each animal has received in consequence thereof; and then proceed to give their history together, still marking any peculiarity observable in one of the species which is not found in the rest.

Next to the great panther, already mentioned, is the animal which Mr. Buffon calls the leopard, a name which he acknowledges to be given arbitrarily, for the sake of distinction. Other naturalists have not much attended to the slight differences between this and the great panther, nor have they considered its discriminations as sufficient to entitle it to another name. It has hitherto, therefore, gone under the name of the leopard, or panther of Senegal, where it is chiefly found. The differences between this animal and the former are these; the large panther is often found to be six feet long, from the tip of the nose to the insertion of the tail; the panther of Senegal is not above four. The large panther is marked with spots in the manner of a rose, that is, five or six make a kind of circle, and there is generally a large one in the middle. The leopard of Senegal has a much more beautiful coat, the yellow is more brilliant, and the spots are smaller, and not disposed in rings but in clusters. As to the rest, they are both whitish under the belly; the tail in both is pretty long, but rather longer in proportion in the latter than in the former. To these two animals, whose differences seem to be so very minute, we may add a third, namely, the jaguar, or panther of America.[21] This, in every respect, resembles the two former, except in the disposition of its spots, and that its neck and head are rather streaked than spotted. The jaguar is also said to be lower upon its legs, and less than the leopard of Senegal. These three quadrupeds, as we see, have but very slight differences, and the principal distinction used by Mr. Buffon is taken from the size: the first, as he says, is usually six feet long; the second, four feet; and the last about three; however, it appears from the particular subjects of his description, that the panther in his possession was not above three feet seven inches long; that the leopard's skin which he describes was about four; and that the jaguar, at two years old, was between two and three feet long, which, when come to its full growth, would, no doubt, be four feet long, as well as the two former. From hence, therefore, we may conclude, that the size in these animals is not sufficient to make a distinction among them; and that those who called them all three by the indiscriminate names of the leopard and the panther, if not right, were at least excusable. Of those which are now to be seen in the tower, the jaguar, or the American panther, is rather the largest of the three, and is, by no means, the contemptible animal which Mr. Buffon describes it to be; the leopard is the least of them, and has, by some travellers, been supposed to be an animal produced between the panther and the ounce, an animal which it resembles, but is less than any of the former. These three animals we may, therefore, rank together, as they agree pretty nearly in their robe, their size, their dispositions, and their ferocity.

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[21] Buffon, the brilliancy of whose work has blinded mankind to his imperfections, imbibed an idea which he never seems to have lost sight of, that the American animals were degenerate, and less in size than

We come next to an animal confessedly different from any of the former, being much smaller, and its colour more inclining to white. Its name, however, in our language, has caused no small confusion. It has been generally called by foreigners the onza, or the ounce, and this name some of our own writers have thought proper to give it; but others of them, and these the most celebrated, such as Willoughby, have given this name to a different animal, with a short tail, and known to the ancients and moderns by the name of the *lynx*. I confess myself at a loss, in this case, whom to follow; the alteration of names should be always made with great caution, and never but in cases of necessity. If we follow Willoughby, there will be an animal of the panther kind, very distinguishable from all the rest, left without a name; and if we recede from him, it will serve to produce some confusion among all the numerous class of readers and writers who have taken him for their guide; however, as he seems himself to have been an innovator, the name of the lynx having been long adopted into our language before, it was unnecessary to give the animal that bore it another name, and to call that creature an ounce, which our old writers had been accustomed to know by the Latin appellation; for this reason, therefore, we may safely venture to take a name that has been long misapplied, from the lynx, and restore it to the animal in question. We will, therefore, call that animal of the panther kind, which is less than the panther, and with a longer tail, the *ounce;* and the lynx may remain in possession of that name by which it was known among all our old English writers, as well as by all antiquity.

The ounce, or the onka of Linnæus, is much less than the panther, being not at most above three feet and a half long: however, its hair is much longer than that of the panther, and its tail still more so. The panther of four or five feet long, has a tail but of two feet, or two feet and a half; the ounce, which is but about three feet, has a tail often longer than the rest of its body. The colour of the ounce is also apparently different, being rather more inclining to a cream-colour, which is deeper on the back, and whiter towards the belly. The hair on the back is an inch and a half long, and that on the belly two inches and a half, which is much longer than that of the panther. Its spots are disposed pretty much in the same manner as the large panther except that on the haunches it is rather marked with stripes than with spots.

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the species of the Old World belonging to the same order: hence, probably, he was led into a misunderstanding, or too willingly confirmed in error on this subject. He has mistaken the jaguar, which he describes from an ocelot; and refers the former animal, because, probably, it was a large species, to the panther of the ancients, transposing his figures accordingly. The furriers and exhibiters of wild beasts have imbibed this error; and the jaguar of America has altogether usurped the name of panther from the species of the Old World, to which it was originally applied. The animals of the cat kind are, in general, strongly marked, but inclinations are to be found in certain of its species both to the dogs and the viverræ; the cheetah or hunting leopard is the type of the former. In the system of dentition, and all the organs of sense, it corresponds with the felinæ, but in the non-retractibility of the claws, it differs from the genus in general.

In this species, we have, in a remarkable manner, the opportunity of observing the mutual harmony existing between the mental impulses and the physical powers of animals; their disposition or inclination to destruction is precisely in unison and proportion with bodily powers. If very weak, they are excessively timid; if extremely strong, they are equally undaunted; while those which hold a medium station in this respect seem generally to appreciate, as it were, with more sobriety, the conditions of their existence, and to submit themselves to the dominion and artificial education of man more easily than the rest. The hunting leopard is in this intermediate situation. About as big as a large dog, its leading weapons of offence, the claws, are in the same situation as those of that animal; incapable of being withdrawn into a sheath for protection, they are constantly exposed to the friction of the ground, by which they become worn and blunt, and so much the less effectual for active warfare; but otherwise the animal has all the suppleness and elasticity, the trenchant teeth, and the powerful jaws of the cats. Partially deficient, therefore, in the physical powers of its congeners, it is equally wanting in the extreme ferocity of its disposition.—ED.

Descending to animals of this kind that are still smaller, we find the catamountain, which is the ocelot of Mr. Buffon, or the tiger-cat of most of those who exhibit it as a show. It is less than the ounce, but its robe more beautifully variegated. It is an American animal, and is about two feet and a half in length from the nose to the insertion of the tail. It is extremely like a cat, except that it is larger and slenderer, that its colours are more beautiful, and its tail rather shorter. The fur is of a reddish colour, the whole beautified with black spots, and streaks of different figures. They are long on the back, and round on the belly and paws. On the ears are black stripes, which run across; but in other respects they entirely resemble those of a cat. These colours, however, which naturalists have taken great pains minutely to describe, are by no means permanent, being differently disposed in different animals of the same species. I remember to have seen an animal of this size, but whether of this species I will not pretend to say, some years ago, that was entirely brown, and was said also to have come from America.

From this tribe of the cat kind, with spotted skins and a long tail, we come to another, with skins diversified in like manner, but with a shorter tail. The principal of these is the lynx, the name by which the animal was known to Ælian, among the ancients; and to all our old English writers, among those of a more modern date. This name has been corrupted by the Portuguese into the word *onze;* and this corruption has been adopted by Ray, who has improperly called this animal the *ounce*, after some of the foreign travellers. The first striking distinction between the lynx, and all those of the panther kind, is in its tail, which is at least half as short in proportion, and black at the extremity. Its fur is much longer, the spots on the skin less vivid, and but confusedly mingled with the rest. Its ears are much longer, and tipped at the points with a black tuft of hair. The colour round the eyes is white, and the physiognomy more placid and gentle. Each hair of this animal is of three different colours; the root is of a grayish brown; the middle red, or of an ash colour; and the ends white. This whiteness at the ends takes up so small a part of the particular hair, that it does not prevent us from seeing the principal colour, which is that of the middle part; so that it only makes the surface of the body appear as if it were silvered over; however, the hair of which the spots consist has no white at the ends, and at the roots it is not quite so black as the other part. This animal is not above the size of the ounce, but is rather stronger built, and it has but twenty-eight teeth; whereas all the rest of the cat kind already mentioned have thirty.

Another animal of this kind is called the siagush, or, as Mr. Buffon names it, the caracal. It is a native of the East Indies, and resembles the lynx in size, in form, and even in the singularity of being tufted at the tips of the ears. However, the siagush differs in not being mottled as the lynx is; its fur, or rather hair, is rougher and shorter; its tail is rather longer; its muzzle more lengthened; its physiognomy more fierce, and its nature more savage.[22]

The third and last animal that needs to be mentioned of this kind, is that which Mr. Buffon calls the serval, and which he has first described. It is a native of Malabar, resembling the panther in its spots, but the lynx in the shortness of its tail, in its size, and in its strong-built form.

These seem to be all the principal distinctions among animals of the panther kind, from the largest of this tribe down to the domestic cat, which is the smallest of all these fierce and mischievous varieties. In all, their nature seems tty much the same; being equally fierce, sub- , cruel, and cowardly. The panther, including leopard and the jaguar, or American panther, they are the largest, so also are they the most agerous of this kind; for the whole race of s are noxious in proportion to their power to mischief. They inhabit the most torrid lati- les of India, Africa, and America, and have er been able to multiply beyond the torrid e. They are generally found in the thickest the most entangled forests, and often near note habitations, where they watch to surprise kinds of domestic animals. They very seldom ack man, even though provoked by him; they m rather desirous of finding safety by flight, by climbing trees, at which they are very ex- t. In this manner also they often pursue ir prey, and, being expert at seizing it, as well ve as below, they cause a vast destruction. all other animals, these are the most sullen, l, even to a proverb, untameable. They still serve their fierce and treacherous spirit; and those places where they are exposed to be seen ong others, we often observe, that while their per is familiar with the lion or the bear, yet is apprehensive of the large panther, and keeps ound with the shortest chain.

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[22] The caracal, which is unquestionably identical with the lynx of the ancients, but whose original name has been, in modern times, usurped by an animal of northern origin, utterly unknown to the Greeks, and distinguished by the Romans by a totally different appellation, is a native of most of the warmer climates of the Old World, infesting probably as large an extent of the surface of the earth as the lion or the leopard themselves. Throughout the whole of Africa, from Egypt and Barbary to the extremity of Caffraria, and in the southern half of Asia, at least as far eastwards as the Ganges, he follows, as it were, in the footsteps of those larger and more formidable beasts. So uniformly indeed has he been met with in the train of the lion, that many early writers, determined to find a reason for every thing, laid it down as a settled fact that the caracal, equally with the jackal, although in a different manner, was the lion's purveyor; that he accompanied that terrible animal in the pursuit of his prey; pointed it out to him by means of his more delicate nostril and piercing sight; and, when his royal master had finished his meal, received a portion of the flesh in reward for his good and loyal service. But the greater part of this fanciful tale is now known to have had its origin only in the imagination of men who had caught a glimpse of the real truth, and made up for the want of accurate observation by the invention of a theory almost as fabulous as the stories of the ancients, which attributed to the same animal such wonderful powers of sight as to pierce even through stone walls. In size the caracal is somewhat larger than the fox. The whole of the upper surface of his body is of a deep and uniform brown, the hair being for the most part slightly tipped with gray; the under and inner parts are nearly white; and the chin and lower lip, and two spots, one on the inner side of and above the eye, and the other beneath its outer angle, completely so. The neck and throat are of a lighter and brighter brown than the rest of the fur. The ears, which are long and upright, taper gradually to a fine tip, which is surmounted by a pencil of long black hairs; they are black externally and whitish within. It is to the striking character afforded by these organs that the animal is indebted for his modern name of *caracal*, corrupted from his Turkish appellation, which, equally with that by which he is known in Persia, signifies "black ear." His whiskers are short, and take their origin from a series of black lines which occupy the sides of the muzzle; at some distance behind them, in front of the neck on each side, is a short and thick tuft of lighter coloured hairs. The tail, which is eight or nine inches in length, is of the same uniform colour with the body from its base to its tip.—Ed.

s the ounce differs from these in figure and , so also it seems to differ in disposition, being re mild, tractable, and tame. These we often as harmless and innocent as cats; and there ne at present in the Tower with which the per plays without the smallest apprehension. wn I was not a little uneasy at first for the n, when he put his hand through the bars, called the animal by its name; but was a d deal surprised to see the creature, which might suppose irritated by long confinement, e gently up to him, stroke his hand with its , in the manner of a cat, and testify the ut- t gentleness of disposition. The ounce, there- , is remarkable for being easily tamed; and, act, it is employed all over the East for the poses of hunting. Not, indeed, but that pan- rs themselves are sometimes used for this pur- , but they are never thoroughly subdued like former, being usually brought to the field in rriage, and kept chained and caged until they shown the gazelle, or the leveret, which is ir prey. This they pursue rather by three or r great springs than by running. If they e it by this sudden effort, it finds no mercy; if it escapes from their first effort, they never empt to pursue, and appear quite disappointed confounded at their mischance. It some- es happens that they are so much enraged at that they attack even their employer, and his y resource to avoid their fury is to throw them e small pieces of meat, which he has brought h him for that purpose.[23]

The ounce, however, is not so dangerous; and is treated with more confidence and familiarity. It is usually brought to the field hood-winked behind one of the horsemen. When the game ap-

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3 The hunting-leopard is of a pale yellow colour on upper part, white underneath, and covered all r with very small spots without regularity; it has a slight erect mane down the neck, whence it is named. The eye-pupil is round at all times. The slim make of the body and limbs of this animal, calculated apparently rather for speed than strength, assimilate it in a remarkable degree to the canine race, with which we have already compared it. In a certain aptness or capability it possesses of being trained for field sports, it is also more like the dogs than the cats. It is, therefore, strictly speaking, intermediate, and we appear to pass naturally from the latter race of animals through this species to the former. It also exhibits the first step or remove from the perfect fitness for carnivorous and predatory habits in the loss of the retractile power of the talons. Of the habits of the hunting-leopard in a state of nature we have no certain information; but in his tamed and domesticated condition he has been rendered, in some countries at least, auxiliary to man, by the successful cultivation of his mental faculties, which have been trained into a degree of subservience to the commands of his master, that can only be surpassed by the superior sagacity of the hound. Chardin, Bernier, Tavernier, and others of the older travellers, had related that in several parts of Asia it was customary to make use of a large spotted cat in the pursuit of game, and that this animal was called *youze* in Persia, and *cheetah* in India; but the statements of these writers were so imperfect, and the descriptions given by them so incomplete, that it was next to impossible to recognise the particular species intended. We now, however, know with certainty that the animal thus employed is the Filis jubata of naturalists; which inhabits the greater part both of Asia and of Africa. It is common in India and Sumatra, as well as in Persia; and is well known both in Senegal and at the Cape of Good Hope; but the ingenuity of the savage natives of the latter countries has not, so far as we know, been exerted in rendering its services available in the chase in the manner so successfully practised by the more refined and civilized inhabitants of Persia and of Hindostan. In Senegal it is valued only on account of its skin, which forms an important article in the commerce of that colony; while at the Cape, where it is known to the Dutch settlers by the misapplied name of *luipard* (leopard), it seems to be entirely neglected even in a commercial point of view. In the neighbourhood of the latter colony, it should be added, the animal appears, from the testimony of travellers, to be of rare occurrence; and Professor Lichtenstein, in particular, mentions an instance in which the skin of one was worn by the chief of a horde of Caffres as a badge of peculiar dignity and distinction. But even in the East, where the qualities of the cheetah appear to be best appreciated, and his faculties to be turned to most account, it would seem that he is not employed in hunting by all classes of the people indiscriminately; but, on the contrary, that he is reserved for the especial amusement and gratification of the nobles and princes of the land, rather than used for purposes of real and general advantage.

The cheetah has been until of late years very imperfectly known in Europe. Linnæus was entirely unacquainted with it, and Buffon described it from the fur alone under the name of guepard, the appellation by which its skin was distinguished in the commerce with Senegal, but evidently without suspecting its identity with the Asiatic animal, the trained habits of which, misled probably by the authority of Tavernier, he erroneously attributed to his imaginary ounce. Subsequent French zoologists had rectified pears, the ounce is instantly uncovered, and shown where it lies: upon which the fierce creature darts like an arrow to the place, and seizes it at once, or, missing it, remains motionless on the place. It would be vain to attempt retrieving its disgrace, by continuing the pursuit; for, although it bounds with greater agility than most other animals, yet it is slow and awkward in running, and has no means of finding the animal it pursues by the smell, as is common among those of the dog kind. From hence, therefore, it appears, how much superior the European method of hunting is to that of the Asiatic: since whatever amusement this exercise affords must arise from the continuance of the chase, and from the fluctuation of doubt and expectation, which raise and depress the pursuers by turns. All this an Asiatic hunter is deprived of; and his greatest pleasure can scarcely be more than what among us is called *coursing*, in which the dog pursues the animal, and keeps it constantly in view.

But it must not be supposed that it is from choice the Asiatics use this method of chase; for, no doubt, were dogs serviceable among them as they are in Europe, they would be employed for the same purposes. But the fact is, that the extreme heat of the tropical climates produces such universal putrefaction, and sends up such various and powerful scents, that dogs are at first bewildered in the chase, and, at last, come to lose the delicacy of their scent entirely. They are, therefore, but little used in those warm countries; and what could they avail in places where almost every other animal of the forest is stronger and more rapacious? The lion, the tiger, the panther, and the ounce, are all natural enemies to the dog, and attack him wherever he appears with ungovernable fury. The breed, therefore, in those places would quickly be destroyed; so that they are obliged to have recourse to those animals which are more fitted to serve them; and thus convert the ounce to those purposes for which dogs are employed in Europe.

The catamountain or ocelot, is one of the fiercest, and, for its size, one of the most destructive animals in the world. It is, as was before observed, a native of South America, and by no means capable of the same education as the ounce, which it more approaches in size than in disposition. Two of these, from whom Mr. Buffon has taken his description, were brought over from Carthagena, and having been taken from the dam when very young, were afterwards suckled by a bitch. But before they were three months old, they had strength and ingratitude enough to kill and devour their nurse. Their succeeding fierceness and malignity seemed to correspond with their first efforts; for no arts could tame or soften their natures; and while they continued in their cages, they still testified an unceasing disposition for slaughter. When their food was given them, the male always served himself before the female ventured to touch a bit; and it was not till he was satisfied that the other began. In their savage state, these animals are still more destructive; having great strength and agility, they very easily find and overtake their prey, which they pursue among the tops of the trees as well as on the ground; but what renders them still more mischievous is, their unceasing appetite rather for the blood than for the flesh of their prey. They suck this with the greatest avidity, but frequently leave the carcass otherwise untouched, in order to pursue other animals for the blood in like manner. They generally continue on the tops of trees, like our wild cats, where they make their nest, and often bring forth their young. When they spy any animal they can master, and there are but few in the forest but what are inferior, they dart down upon it with inevitable exactness.

The whole tribe of animals of the panther kind, with long tails, are chiefly inhabitants, as was said, of the torrid zone; but those of the short-tailed kind, and particularly the lynx, are principally found in the cold countries that are bordering on the pole. The lynx is chiefly to be met with in the north of Germany, Lithuania, Muscovy, Siberia, and North America. Those of the new continent, however, are rather smaller than in Europe, as is the case with almost all their quadrupeds; they are somewhat whiter also, but in other respects there is scarcely any difference to be found among them.[24] This animal has been called by some *lupus cervarius*, or a creature compounded between a wolf and a stag; but for what reason, is hard to guess; it no way resembles either, in shape or in disposition. In its nature, it exactly resembles the cat, except that being bigger, and nearly two feet long, it is bolder and fiercer. Like the cat, it climbs trees, and seeks its prey by surprise; like the cat, it is delicate and cleanly, covering its urine with its paws; and it resembles the wolf in nothing except its cry, which often deceives the hunters, and induces them to think they hear a wolf and not a lynx. This animal also is rather more delicate than the cat; and, after having once feasted upon its prey, will never return to it again, but hunts the woods for another. From hence may have arisen the common report of the lynx having, of all other quadrupeds, the shortest memory. This, however, is not the only idle story that has been propagated of it; as of its seeing with such perspicuity, as to perceive ob-

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this error, and it was generally believed that the tamed leopard of Bernier, the youze, the guepard, and Tavernier's ounce, were one and the same animal; but it was not until a year or two ago that the possession of a living specimen, brought from Senegal, in the Managerie of the Jardin du Roi, enabled M. F. Cuvier to ascertain its characters with precision.—Ed.

[24] Buffon.

jects through walls and mountains; as of having its urine of such a quality, as to harden and become a precious stone; with several others propagated by ignorance or imposture.

The syagush and the serval are both so like all the rest of the cat kind in disposition, that it is but repeating the same account once more to give their distinct history. As the lynx is found only in cold countries, so the syagush is to be met with only in the warm tropical climates. It is used, in the same manner as the ounce, for hunting; but it seems to have a property which the other has not; namely, that of being able to overtake its prey by pursuing it. Whether this is performed by having a finer scent than the former, or greater swiftness, we are not informed; being only told that when it overtakes either the gazelle or the antelope, it leaps upon their backs, and, getting forward to their shoulder, scratches their eyes out, by which means they become an easy prey to the hunters. Some have called this animal the *lion's provider;* and it is said, that when it calls him to pursue his prey, its voice very much resembles that of one man calling another.[25] From hence we may conjecture that this animal pursues its prey in full cry, and that the lion only follows to partake or seize the spoil. The same account is given also of the jackal; and very probably it may be true, not only of these animals, but of some others, since it is natural enough to suppose that the lion will pursue whenever he is taught to discover his prey.

We had one of these animals a few years ago, sent over from the East Indies, but it was not able to endure the change of climate, and it died in a very short time after it was brought to the Tower. Whether consumed by disease or not, I cannot tell, but it seemed to me much slenderer than the cat or the lynx, and its ears were much longer; however, it is a very strong creature for its size, and has been known to kill a large dog in single combat:[26] nevertheless, it is, like all of the cat kind, except the lion, remarkable for its cowardice, and will never, except in cases of necessity, attack an animal that is its equal in strength or activity. For this reason, when brought into the field, and put upon a service of danger, it obstinately refuses, and is alert only in the pursuit of animals that are too feeble for resistance, or too timid to exert their strength.

From what has been said of this rapacious tribe, we perceive a similitude in the manners and dispositions of them all, from the lion to the cat. The similitude of their internal conformation is still more exact; the shortness of their intestines, the number of their teeth, and the structure of their paws. The first of this class is the lion, distinguishable from all the rest by his strength, his magnitude, and his mane. The second is the tiger, rather longer than the lion, but not so tall, and known by the streaks and the vivid beauty of its robe; including also the American tiger or cougar; distinguishable by its size, next to that of the tiger, its tawny colour, and its spots. The third is the panther and the leopard. The fourth is the ounce, not so large as any of the former, spotted like them, but distinguishable by the cream-coloured ground of its hair, and the great length of its tail, being above the length of its body. The fifth is the catamountain or tiger cat, less than the ounce, but differing particularly in having a shorter tail, and being streaked down the back like a tiger. The sixth is the short-tailed kind; namely, the lynx, of the size of the former, but with a short tail, streaked, and the tips of its ears tufted with black. The seventh is the syagush, differing from the lynx in not being mottled like it, in not being so large, and in having the ears longer, though tipped with black, as before. The eighth is the serval, resembling the lynx in its form, and the shortness of its tail; streaked also like it, but not having the tips of its ears tufted. Lastly, the cat, wild and tame, with all its varieties; all less than any of the former, but, like them, equally insidious, rapacious, and cruel.

This whole race may be considered as the most formidable enemy of mankind; there are others indeed stronger, but they are gentle, and never offer injury till injured; there are others more numerous, but they are more feeble, and rather look for safety by hiding from man, than opposing him. These are the only quadrupeds that make good their ground against him; and which may be said to keep some kingdoms of the earth in their own possession. How many extensive countries are there in Africa, where the wild beasts are so numerous, that man is deterred from living amongst them; reluctantly giving up to the lion and the leopard, extensive tracts, that seem formed only for his delight and convenience!

CHAP. II.

ANIMALS OF THE DOG KIND.

The second class of carnivorous quadrupeds may be denominated those of the *dog* kind. This class is neither so numerous nor so powerful as the former, and yet neither so treacherous, rapacious, or cowardly. This class may be principally distinguished by their claws, which have no sheaths, like those of the cat kind, but still continue at the point of each toe, without a capability of being stretched forward, or drawn back. The nose also, as well as the jaw, of all the dog kind, is longer than in the cat; the body is, in proportion, more strongly made, and covered with hair instead of fur. There are many internal distinctions also; as in the intestines, which are much longer in the dog kind than in those of the cat; the eye is not formed for night vision; and the olfactory nerves are diffused, in the dog kinds, upon a very extensive membrane within the skull.

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[25] Thevenot, vol. ii. p. 114.

[26] Buffon.

If we compare the natural habitudes of this class with the former, we shall find that the dog kinds are not so solitary as those of the cat, but love to hunt in company, and encourage each other with their mutual cries. In this manner the dog and the jackal pursue their prey; and the wolf and fox, which are of this kind, though more solitary and silent among us, yet, in countries where less persecuted, and where they can more fearlessly display their natural inclinations, they are found to keep together in packs, and pursue their game with alternate howlings.

Animals of the dog kind want some of the advantages of the cat kind, and yet are possessed of others in which the latter are deficient. Upon observing their claws, it will easily be perceived that they cannot, like cats, pursue their prey up the sides of a tree, and continue their chase among the branches; their unmanageable claws cannot stick in the bark, and thus support the body up along the trunk, as we see the cat very easily perform; whenever, therefore, their prey flies up a tree from them, they can only follow it with their eyes, or watch its motions till hunger again brings it to the ground. For this reason, the proper prey of the dog kind are only those animals that, like themselves, are unfitted for climbing; the hare, the rabbit, the gazelle, or the roe-buck.

As they are, in this respect, inferior to the cat, so they exceed it in the sense of smelling; by which alone they pursue their prey with certainty of success, wind it through all its mazes, and tire it down by perseverance. It often happens, however, in the savage state, that their prey is either too much diminished, or too wary to serve for a sufficient supply. In this case, when driven to an extremity, all the dog kinds can live for some time upon fruits and vegetables, which, if they do not please the appetite, at least serve to appease their hunger.

Of all this tribe the dog has every reason to claim the preference, being the most intelligent of all known quadrupeds, and the acknowledged friend of mankind. The dog,[1] independent of the beauty of his form, his vivacity, force, and swiftness, is possessed of all those internal qualifications that can conciliate the affections of man, and make the tyrant a protector. A natural share of courage, an angry and ferocious disposition, renders the dog, in its savage state, a formidable enemy to all other animals: but these readily give way to very different qualities in the domestic dog, whose only ambition seems the desire to please: he is seen to come crouching along, to lay his force, his courage, and all his useful talents, at the feet of his master; he waits his orders, to which he pays implicit obedience; he consults his looks, and a single glance is sufficient to put him in motion; he is more faithful even than the most boasted among men; he is constant in his affections, friendly without interest, and grateful for the slightest favours; much more mindful of benefits received, than injuries offered, he is not driven off by unkindness; he still continues humble, submissive, and imploring; his only hope to be serviceable, his only terror to displease; he licks the hand that has been just lifted to strike him, and at last disarms resentment, by submissive perseverance.

More docile than man, more obedient than any other animal, he is not only instructed in a short time, but he also conforms to the dispositions and the manners of those who command him. He takes his tone from the house he inhabits; like the rest of the domestics, he is disdainful among the great, and churlish among clowns. Always assiduous in serving his master, and only a friend to his friends, he is indifferent to all the rest, and declares himself openly against such as seem to be dependent like himself. He knows a beggar by his clothes, by his voice, or his gestures, and forbids his approach. When at night the guard of the house is committed to his care, he seems proud of the charge; he continues a watchful sentinel, he goes his rounds, scents strangers at a distance, and gives them warning of his being upon duty. If they attempt to break in upon his territories, he becomes more fierce, flies at them, threatens, fights, and either conquers alone, or alarms those who have most interest in coming to his assistance; however, when he has conquered, he quietly reposes upon the spoil, and abstains from what he has deterred others from abusing; giving thus at once a lesson of courage, temperance, and fidelity.

From hence we see of what importance this animal is to us in a state of nature. Supposing, for a moment, that the species had not existed, how could man, without the assistance of the dog, have been able to conquer, tame, and reduce to servitude, every other animal? How could he discover, chase, and destroy, those that were noxious to him? In order to be secure, and to become master of all animated nature, it was necessary for him to begin by making a friend of a part of them; to attach such of them to himself, by kindness and caresses, as seemed fittest for obedience and active pursuit. Thus the first art employed by man, was in conciliating the favour of the dog; and the fruits of this art were, the conquest and peaceable possession of the earth.

The generality of animals have greater agility, greater swiftness, and more formidable arms, from nature, than man; their senses, and particularly that of smelling, are far more perfect: the having gained, therefore, a new assistant, particularly one whose scent is so exquisite as that of the dog, was the gaining a new sense, a new faculty, which before was wanting. The machines and instruments which we have imagined for perfecting the rest of the senses, do not approach to that already prepared by nature, by which we are enabled to find out every animal, though unseen, and thus destroy the noxious, and use the serviceable.

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[1] The rest of this description of the dog is taken from Mr. Buffon: what I have added, is marked as before.

The dog, thus useful in himself, taken into a participation of empire, exerts a degree of superiority over all animals that require human protection. The flock and the herd obey his voice more readily even than that of the shepherd or the herdsman; he conducts them, guards them, keeps them from capriciously seeking danger, and their enemies he considers as his own. Nor is he less useful in the pursuit; when the sound of the horn, or the voice of the huntsman, calls him to the field, he testifies his pleasure by every little art, and pursues with perseverance those animals, which, when taken, he must not expect to divide. The desire of hunting is indeed natural to him, as well as to his master, since war and the chase are the only employment of savages. All animals that live upon flesh hunt by nature; the lion and the tiger, whose force is so great that they are sure to conquer, hunt alone, and without art; the wolf, the fox, and the wild dog, hunt in packs, assist each other, and partake the spoil. But when education has perfected this talent in the domestic dog; when he has been taught by man to repress his ardour, to measure his motions, and not to exhaust his force by too sudden an exertion of it; he then hunts with method, and always with success.

"Although the wild dog, such as he was before he came under the protection of mankind, is at present utterly unknown, no such animal being now to be found in any part of the world, yet there are many that, from a domestic state, have turned savage, and entirely pursue the dictates of nature." In those deserted and uncultivated countries where the dog is found wild, they seem entirely to partake of the disposition of the wolf; they unite in large bodies, and attack the most formidable animals of the forest, the cougar, the panther, and the bison. In America, where they were originally brought by the Europeans, and abandoned by their masters, they have multiplied to such a degree, that they spread in packs over the whole country, attack all other animals, and even man himself does not pass without insult. They are there treated in the same manner as all other carnivorous animals, and killed wherever they happen to come: however, they are easily tamed; when taken home, and treated with kindness and lenity, they quickly become submissive and familiar, and continue faithfully attached to their masters. Different in this from the wolf or the fox, who, though taken never so young, are gentle only while cubs, and, as they grow older, give themselves up to their natural appetites of rapine and cruelty. In short, it may be asserted, that the dog is the only animal whose fidelity is unshaken; the only one who knows his master, and the friends of the family; the only one who instantly distinguishes a stranger; the only one who knows his name, and answers to the domestic call; the only one who seems to understand the nature of subordination, and seeks assistance; the only one who, when he misses his master, testifies his loss by his complaints; the only one who, carried to a distant place, can find the way home; the only one whose natural talents are evident, and whose education is always successful.

In the same manner, as the dog is of the most complying disposition, so also it is the most susceptible of change in its form; the varieties of this animal being too many for even the most careful describer to mention. The climate, the food, and the education, all make strong impressions upon the animal, and produce alterations in its shape, its colour, its hair, its size, and in every thing but its nature. The same dog, taken from one climate, and brought to another, seems to become another animal; but different breeds are as much separated, to all appearance, as any two animals the most distinct in nature. Nothing appears to continue constant with them, but their internal conformation; different in the figure of the body, in the length of the nose, in the shape of the head, in the length and the direction of the ears and tail, in the colour, the quality, and the quantity of the hair; in short, different in every thing but that make of the parts which serve to continue the species, and keep the animal distinct from all others. It is this peculiar conformation, this power of producing an animal that can reproduce, that marks the kind, and approximates forms that at first sight seem never made for conjunction.

From this single consideration, therefore, we may at once pronounce all dogs to be of one kind; but which of them is the original of all the rest, which of them is the savage dog from whence such a variety of descendants have come down, is no easy matter to determine. We may easily, indeed, observe, that all those animals which are under the influence of man, are subject to great variations. Such as have been sufficiently independent, so as to choose their own climate, their own nourishment, and to pursue their own habitudes, preserve the original marks of nature, without much deviation; and it is probable, that the first of these is even at this day very well represented in their descendants. But such as man has subdued, transported from one climate to another, controlled in their manner of living and their food, have most probably been changed also in their forms; particularly the dog has felt these alterations more strongly than any other of the domestic kinds; for living more like man he may be thus said to live more irregularly also, and consequently must have felt all those changes that such variety would naturally produce. Some other causes also may be assigned for this variety in the species of the dog: as he is perpetually under the eye of his master, when accident has produced any singularity in its productions man uses all his art to continue this peculiarity unchanged; either by breeding from such as had those singularities, or by destroying such as happened to want them; besides, as the dog produces much more frequently than some other animals, and lives a shorter time, so the chance for its varieties will be offered in greater proportion.[2]

But which is the original animal, and which the artificial or accidental variety, is a question which, as was said, is not easily resolved. If the internal structure of dogs of different sorts be compared with each other, it will be found, except in point of size, that in this respect they are exactly the same. This, therefore, affords no criterion. If other animals be compared with the dog internally, the wolf and the fox will be found to have the most perfect resemblance; it is probable, therefore, that the dog, which most nearly resembles the wolf or the fox externally, is the original animal of its kind; for it is natural to suppose, that as the dog most nearly resembles them internally, so he may be near them in external resemblance also, except where art or accident has altered his form. This being supposed, if we look among the number of varieties to be found in the dog, we shall not find one so like the wolf or the fox as that which is called the *shepherd's dog*. This is that dog with long coarse hair on all parts except the nose, pricked ears, and a long nose; which is common enough among us, and receives his name from being principally used in guarding and attending on sheep. This seems to be the primitive animal of his kind; and we shall be the more confirmed in this opinion if we attend to the different characters which climate produces in this animal, and the different races of dogs which are propagated in every country; and, in the first place, if we examine those countries which are still savage, or but half-civilized, where it is most probable the dog, like his master, has received but few impressions from art, we shall find the shepherd's dog or one very like him, still prevailing amongst them. The dogs that have run wild in America, and in Congou, approach this form. The dog of Siberia, Lapland, and Iceland, of the Cape of Good Hope, of Madagascar, Madura, Calicut, and Malabar, have all a long nose, pricked ears, and resemble the shepherd's dog very nearly. In Guinea, the dog very speedily takes this form; for at the second or third generation the animal forgets to bark, his ears and his tail become pointed, and his hair drops off, while a coarser thinner kind comes in the place. This sort of dog is also to be found in the temperate climates in great abundance, particularly among those who, preferring usefulness to beauty, employ an animal that requires very little instruction to be serviceable. Notwithstanding this creature's deformity, his melancholy and savage air, he is superior to all the rest of his kind in instinct; and without any teaching, naturally takes to tending flocks, with an assiduity and vigilance that at once astonishes and yet relieves his master.

In more polished and civilized places, the dog seems to partake of the universal refinement; and, like the men, becomes more beautiful, more majestic, and more capable of assuming an education foreign to his nature. The dogs of Albany, of Greece, of Denmark, and of Ireland, are larger and stronger than those of any other kind. In France, Germany, Spain, and Italy, the dogs are of various kinds, like the men; and this variety seems formed by crossing the breed of such as are imported from various climates.

The shepherd's dog may, therefore, be considered as the primitive stock from whence these varieties are all derived. He makes the stem of that genealogical tree which has been branched out into every part of the world. This animal still continues pretty nearly in its original state among the poor in temperate climates; being transported into the colder regions, he grows less and more ugly among the Laplanders; but becomes more perfect in Iceland, Russia, and Siberia, where the climate is less rigorous, and the people more civilized. Whatever differences there may be among the dogs of these countries, they are not very considerable, as they all have straight ears, long and thick hair, a savage aspect, and do not bark either so often or so loud as dogs of the more cultivated kind.

The shepherd's dog, transported into the temperate climates, and among people entirely civilized, such as England, France, and Germany, will be divested of his savage air, his pricked ears, his rough, long, and thick hair, and from the single influence of climate and food alone, will become either a matin, a mastiff, or a hound. These three seem the immediate descendants of the former, and from them the other varieties are produced.

The HOUND, the HARRIER, and the BEAGLE, seem all of the same kind; for although the bitch is covered but by one of them, yet in her litters are found puppies resembling all the three. This animal, transported into Spain or Barbary, where the hair of all quadrupeds becomes soft and long, will be there converted into the land-spaniel, and the water-spaniel, and these of different sizes.

The GRAY MATIN HOUND, which is the second branch, transported to the north, becomes the great Danish dog; and this sent into the south, becomes the greyhound of different sizes. The same transported into Ireland, the Ukraine Tartary, Epirus, and Albania, becomes the great wolf-dog, known by the name of the Irish wolf-dog.

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[2] See Supplementary Note A, p. 397.

The **MASTIFF**, which is the third branch, and chiefly a native of England, when transported into Denmark, becomes a little Danish dog; and this little Danish dog, sent into the tropical and warm climates, becomes the animal called the **TURKISH DOG**, without hair. All these races, with their varieties, are produced by the influence of climate, joined to the different food, education, and shelter which they have received among mankind. All other kinds may be considered as mongrel races, produced by the concurrence of these, and found rather by crossing the breed than by attending to the individual

"As these are extremely numerous and very different in different countries, it would be almost endless to mention the whole; besides, nothing but experience can ascertain the reality of these conjectures, although they have so much the appearance of probability; and until that gives more certain information, we must be excused from entering more minutely into the subject.

"With regard to the dogs of our country in particular, the varieties are very great, and the number every day increasing. And this must happen in a country so open by commerce to all others, and where wealth is apt to produce capricious predilection. Here the ugliest and the most useless of their kinds will be entertained merely for their singularity; and being imported only to be looked at, they will lose even that small degree of sagacity which they possessed in their natural climates. From this importation of foreign useless dogs, our own native breed is, I am informed, greatly degenerated, and the varieties now to be found in England much more numerous than they were in the times of Queen Elizabeth, when Doctor Caius attempted their natural history. Some of those he mentions are no longer to be found among us, although many have since been introduced, by no means so serviceable as those which have been suffered to decay.

"He divides the whole race into three kinds. The first is, the generous kind, which consists of the terrier, the harrier, and the blood-hound; the gaze-hound, and grey-hound, the leymmer, and the tumbler; all these are used for hunting. Then the spaniel, the setter, and the water-spaniel, or finder, were used for fowling; and the spaniel gentle, or lap-dog, for amusement. The second is the farm kind; consisting of the shepherd's dog and the mastiff. And the third is the mongrel kind; consisting of the wappe, the turnspit, and the dancer. To these varieties we may add at present, the bull-dog, the Dutch mastiff, the harlequin, the pointer, and the Dane, with a variety of lap-dogs, which, as they are perfectly useless, may be considered as unworthy of a name.

"The terrier is a small kind of hound,[3] with rough hair, made use of to force the fox or the badger out of their holes; or rather to give notice by their barking, in what part of their kennel the fox or badger resides, when the sportsmen intend to dig them out.

"The harrier, as well as the beagle and the fox-hound, are used for hunting; of all other animals, they have the quickest and most distinguishing sense of smelling. The proper breeding, matching, and training these, make up the business of many men's lives.

"The blood-hound was a dog of great use, and in high esteem among our ancestors. Its employ was to recover any game that had escaped wounded from the hunter, or had been killed, and stolen out of the forest. But it was still more employed in hunting thieves and robbers by their footsteps. At that time, when the country was less peopled than at present, and when, consequently, the footsteps of one man were less crossed and obliterated by those of others, this animal was very serviceable in such pursuits; but at present, when the country is everywhere peopled, this variety is quite worn out; probably because it was found of less service than formerly.

"The gaze-hound hunted, like our grey-hounds, by the eye, and not by the scent. It chased indifferently the fox, hare, or buck. It would select from the herd the fattest and fairest deer, pursue it by the eye, and if lost recover it again with amazing sagacity. This species is now lost or unknown among us.

"The grey-hound is very well known at present, and was formerly held in such estimation, that it was the peculiar companion of a gentleman, who, in the times of semi-barbarism, was known by his horse, his hawk, and his grey-hound. Persons under a certain rank of life are forbidden, by some late game-laws, from keeping this animal; wherefore, to disguise it the better, they cut off its tail.

"The leymmer is a species now unknown to us. It hunted both by scent and sight, and was led in a leyme or thong, from whence it received its name.

"The tumbler was less than the hound, more scraggy, and had pricked ears; so that by the description it seems to answer to the modern lurcher. This took its prey by mere cunning, depending neither on the goodness of its nose, nor its swiftness. If it came into a warren, it neither barked nor ran on the rabbits; but seemingly inattentive, approached sufficiently near till it came within reach, and then seized them by a sudden spring.

"The land-spaniel, which probably had its name from Spain, where it might have acquired the softness of its hair, is well known at present. There are two varieties of this kind; namely, the slater, used in hawking to spring the game· and the setter, that crouches down when it scents the birds, till the net be drawn over them. I have read somewhere that the famous poet

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[3] British Zoology.

Lord Surry was the first who taught dogs to set, it being an amusement to this day only known in England.

"The water-spaniel was another species used in fowling. This seems to be the most docile of all the dog kind; and this docility is particularly owing to his natural attachment to man. Many other kinds will not bear correction; but this patient creature, though very fierce to strangers, seems unalterable in his affections; and blows and ill usage seem only to increase his regard.

"The lap-dog, at the time of Dr. Caius, was of Maltese breed; at present it comes from different countries; in general the more awkward or extraordinary these are, the more they are prized.

"The shepherd's dog has been already mentioned; and as for the mastiff, he is too common to require a description. Dr. Caius tells us, that three of these were reckoned a match for a bear, and four for a lion. However, we are told that three of them overcame a lion in the times of King James the First; two of them being disabled in the combat, the third obliged the lion to seek for safety by flight.

"As to the last division, namely, of the wappe, the turnspit, and the dancer, these were mongrels, of no certain shape, and made use of only to alarm the family, or, being taught a variety of tricks, were carried about as a show.

"With regard to those of later importation, the bull-dog, as Mr. Buffon supposes, is a breed between the small Dane and the English mastiff. The large Dane is the tallest dog that is generally bred in England. It is somewhat between a mastiff and a greyhound in shape, being more slender than the one, and much stronger than the other. They are chiefly used rather for show than service, being neither good in the yard nor the field. The highest are most esteemed; and they generally cut off their ears to improve their figure, as some absurdly suppose. The harlequin is not much unlike the small Dane, being a useless animal, somewhat between an Italian greyhound and a Dutch mastiff. To these several others might be added, such as the pug-dog, the black breed, and the pointer; but, in fact, the varieties are so numerous as to fatigue even the most ardent curiosity."

Of these of the foreign kinds I shall mention only three, which are more remarkable than any of the rest. The lion-dog greatly resembles that animal, in miniature, from whence it takes its name. The hair of the fore part of the body is extremely long, while that of the hinder part is as short. The nose is short, the tail long, and tufted at the point, so that, in all these particulars, it is entirely like the lion. However, it differs very much from that fierce animal in nature and disposition, being one of the smallest animals of its kind, extremely feeble, timid, and inactive. It comes originally from Malta, where it is found so small that women carry it about in their sleeves.

That animal, falsely called the *Turkish dog*, differs greatly from all the rest of the kind, in being entirely without hair. The skin, which is perfectly bare, is of a flesh colour, with brown spots; and their figure, at first view, is rather disgusting. These seem to be of the small Danish breed, brought into a warm climate, and there, by a succession of generations, divested of their hair. For this reason, they are extremely chilly, and unable to endure the cold of our climate; and even in the midst of summer they continue to shiver as we see men in a frosty day. Their spots are brown, as was said, well-marked, and easily distinguishable in summer, but in the cold of winter they entirely disappear. They are called the Turkish breed, although brought from a much warmer climate; for some of them have been known to come from the warmest parts of Africa and the East Indies.

"The last variety, and the most wonderful of all that I shall mention, is the great Irish wolf-dog, that may be considered as the first of the canine species. This animal, which is very rare, even in the only country in the world where it is to be found, is rather kept for show than use, there being neither wolves nor any other formidable beasts of prey in Ireland, that seem to require so powerful an antagonist. The wolf-dog is therefore bred up in the houses of the great, or such gentlemen as choose to keep him as a curiosity, being neither good for hunting the hare, the fox, nor the stag, and equally unserviceable as a house-dog. Nevertheless, he is extremely beautiful and majestic to appearance, being the greatest of the dog kind to be seen in the world. The largest of those I have seen, and I have seen above a dozen, was about four feet high, or as tall as a calf of a year old. He was made extremely like a greyhound, but rather more robust, and inclining to the figure of the French matin, or the great Dane. His eye was mild, his colour white, and his nature seemed heavy and phlegmatic. This I ascribed to his having been bred up to a size beyond his nature; for we see in man, and all other animals, that such as are overgrown are neither so vigorous nor alert as those of more moderate stature. The greatest pains have been taken with these to enlarge the breed, both by food and matching. This end was effectually obtained, indeed; for the size was enormous; but, as it seemed to me, at the expense of the animal's fierceness, vigilance, and sagacity.—However, I was informed otherwise; the gentleman who bred them assuring me, that a mastiff would be nothing when opposed to one of them, who generally seized their antagonist by the back; he added, that they would worry the strongest bull-dogs in a few minutes to death. But this strength did not appear either in their figure or their inclinations; they seemed rather more timid than the ordinary race of dogs; and their skin was much thinner, and consequently less fitted for combat. Whether with these disadvantages, they were capable, as I was told, of singly coping with bears, others may determine; however, they have but few opportunities, in their own country, of exerting their strength, as all wild carnivorous animals there are only of the vermin kind. Mr. Buffon seems to be of opinion that these are the true Molossian dogs of the ancients: he gives no reason for this opinion; and I am apt to think it ill grounded. Not to trouble the reader with a tedious critical disquisition, which I have all along avoided, it will be sufficient to observe, that Nemesianus, in giving directions for the choice of a bitch, advises to have one of Spartan or Molossian breed; and, among several other perfections, he says that the ears should be dependant, and fluctuate as she runs.[4] This, however, is by no means the case with the Irish wolf-dog, whose ears resemble those of the greyhound, and are far from fluctuating with the animal's motions. But of whatever kind these dogs may be, whether known among the ancients, or whether produced by a later mixture, they are now almost quite worn away, and are very rarely to be met with even in Ireland. If carried to other countries, they soon degenerate; and even at home, unless great care be taken, they quickly alter. They were once employed in clearing the island of wolves, which infested it in great plenty; but these being destroyed, the dogs also are wearing away, as if Nature meant to blot out the species, when they had no longer any services to perform.

"In this manner several kinds of animals fade from the face of Nature, that were once well known, but are now seen no longer. The enormous elk of the same kingdom, that, by its horns, could not have been less than eleven feet high, the wolf, and even the wolf-dog, are extinct, or only continued in such a manner as to prove their former plenty and existence. From hence, it is probable, that many of the nobler kinds of dogs, of which the ancients have given us such beautiful descriptions, are now utterly unknown; since among the whole breed we have not one that will venture to engage the lion or the tiger in single combat. The English bull-dog is perhaps the bravest of the kind; but what are his most boasted exploits to those mentioned of the Epirotic dogs by Pliny, or the Indian dogs by Ælian? The latter gives us a description of a combat between a dog and a lion, which I will take leave to translate.

"When Alexander was pursuing his conquests in India, one of the principal men of that country was desirous of showing him the value of the dogs which his country produced. Bringing his dog into the king's presence, he ordered a stag to be let loose before him, which the dog, despising as an unworthy enemy, remained quite regardless of the animal, and never once stirred from his place. His master then ordered a wild boar to be set out; but the dog thought even this a despicable foe, and remained calm and regardless as before. He was next tried with a bear; but still despising his enemy, he only waited for an object more worthy of his courage and his force. At last they brought forth a tremendous lion, and then the dog acknowledged his antagonist, and prepared for combat. He instantly discovered a degree of ungovernable ardour; and flying at the lion with fury, seized him by the throat, and totally disabled him from resistance. Upon this the Indian, who was desirous of surprising the king, and knowing the constancy and bravery of his dog, ordered his tail to be cut off: which was easily performed, as the bold animal was employed in holding the lion. He next ordered one of his legs to be broken; which, however, did not in the least abate the dog's ardour, but he still kept his hold as before. Another leg was then broken; but the dog, as if he had suffered no pain, only pressed the lion still the more. In this cruel manner all his legs were cut off, without abating his courage; and at last, when even his head was separated from his body, the jaws seemed to keep their former hold. A sight so cruel did not fail to affect the king with very strong emotions, at once pitying the dog's fate, and admiring his fortitude. Upon which the Indian, seeing him thus moved, presented him with four dogs of the same kind, which, in some measure, alleviated his uneasiness for the loss of the former.

"The breed of dogs, however, in that country, is at present very much inferior to what this story seems to imply; since, in many places, instead of dogs, they have animals of the cat kind for hunting. In other places, also, this admirable and faithful animal, instead of being applied to his natural uses, is only kept to be eaten. All over China there are dog-butchers, and shambles appointed for selling their flesh. In Canton, particularly, there is a street appointed for that purpose; and, what is very extraordinary, wherever a dog-butcher appears, all the dogs of the place are sure to be in full cry after him; they know their enemy, and persecute him as far as they are able." Along the coasts of Guinea, their flesh is esteemed a delicacy by the Negroes; and they will give one of their cows for a dog. But, among this barbarous and brutal people, scarce any thing that has life comes amiss; and they may well take up with a dog, since they consider toads, lizards, and even the flesh of the tiger itself as a dainty. It may, perhaps, happen that the flesh of this animal, which is so indifferent in the temperate climates, may assume a better quality in those which are more warm: but it is more than probable that the diversity is rather in man than in the flesh of the dog; since in the cold countries the flesh is eaten with equal appetite by the savages; and they have their dog-feasts in the same manner as we have ours for venison.

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[4] Elige tunc cursu facilem, facilemque recursu,
In Lacedæmonio natam seu rure Molosso—
Renibus ampla satis validis, diductaque coxis;
Cuique nimis molles fluitent in cursibus aures.
NEMESIAN.

In our climate, the wild animals that most approach the dog are the wolf and the fox; these, in their internal conformation, greatly resemble each other, and yet in their natures are very distinct. The ancients asserted that they bred together; and I am assured, by credible persons, that there are many animals in this country bred between a dog and a fox. However, all the endeavours of Mr. Buffon to make them engender, as he assures us, were ineffectual. For this purpose, he bred up a young wolf, taken in the woods, at two months old, with a matin dog of the same age. They were shut up together, without any other, in a large yard, where they had a shelter for retiring. They neither of them knew any other individual of their kind, nor even any other man, but he who had the charge of feeding them. In this manner they were kept for three years; still with the same attention, and without constraining or tying them up. During the first year the young animals played with each other continually, and seemed to love each other very much. In the second year, they began to dispute about their victuals, although they were given more than they could use. The quarrel always began on the wolf's side. They were brought their food, which consisted of flesh and bones, upon a large wooden platter, which was laid on the ground. Just as it was put down, the wolf, instead of falling to the meat, began by driving off the dog; and took the platter in its teeth so expertly, that it let nothing of what it contained fall upon the ground, and in this manner carried it off; but as the wolf could not entirely escape, it was frequently seen to run with the platter round the yard five or six times, still carrying it in a position that none of its contents could fall. In this manner it would continue running, only now and then stopping to take breath, until the dog coming up, the wolf would leave the victuals to attack him. The dog, however, was the stronger of the two, but as it was more gentle, in order to secure him from the wolf's attack, he had a collar put round his neck. In the third year, the quarrels of these ill-paired associates were more vehement, and their combats more frequent; the wolf, therefore, had a collar put about its neck, as well as the dog, who began to be more fierce and unmerciful. During the two first years, neither seemed to testify the least tendency towards engendering; and it was not till the end of the third, that the wolf, which was the female, showed the natural desire, but without abating either in its fierceness or obstinacy. This appetite rather increased than repressed their mutual animosity; they became every day more untractable and ferocious, and nothing was heard between them but the sounds of rage and resentment. They both, in less than three weeks, became remarkably lean, without ever approaching each other but to combat. At length, their quarrels became so desperate, that the dog killed the wolf, who was become more weak and feeble; and he was soon after himself obliged to be killed, for, upon being set at liberty, he instantly flew upon every animal he met, fowls, dogs, and even men themselves not escaping his savage fury.

The same experiment was tried upon foxes, taken young, but with no better success; they were never found to engender with dogs; and our learned naturalist seems to be of opinion that their natures are too opposite ever to provoke mutual desire. One thing, however, must be remarked, that the animals on which he tried his experiments, were rather too old when taken, and had partly acquired their natural savage appetites before they came into his possession. The wolf, as he acknowledges, was two or three months old before it was caught, and the foxes were taken in traps. It may, therefore, be easily supposed, that nothing could ever after thoroughly tame those creatures that had been suckled in the wild state, and had caught all the habitudes of the dam. I have seen these animals, when taken earlier in the woods, become very tame; and indeed, they rather were displeasing by being too familiar than too shy. It were to be wished that the experiment were to be tried upon such as these; and it is more than probable that it would produce the desired success. Nevertheless, these experiments are sufficient to prove that neither the wolf nor the fox are of the same nature with the dog, but each of a species perfectly distinct, and their joint produce most probably unfruitful.

The dog, when first whelped, is not a completely finished animal. In this kind, as in all the rest which bring forth many at a time, the young are not so perfect as in those which bring forth but one or two. They are always produced with the eyes closed, the lids being held together, not by sticking, but by a kind of thin membrane, which is torn as soon as the upper eyelid becomes strong enough to raise it from the under. In general, their eyes are not opened till ten or twelve days old. During that time, the bones of the skull are not completed, the body is puffed up, the nose is short, and the whole form but ill sketched out. In less than a month the puppy begins to use all its senses; and from thence makes hasty advances to its perfection. At the fourth month, the dog loses some of his teeth, as in other animals, and these are renewed by such as never fall. The number of these amount to forty-two, which is twelve more than is found in any of the cat kind, which are known never to have above thirty. The teeth of the dog being his great and only weapon, are formed in a manner much more serviceable than those of the former; and there is scarce any quadruped that has a greater facility in rending, cutting, or chewing his food. He cuts with his incisors or fore teeth, he holds with his four great canine teeth, and he chews his meat with his grinders; these are fourteen in number, and so placed, that when the jaws are shut, there remains a distance between them, so that the dog by opening his mouth ever so wide does not lose the power of his jaws. But it is otherwise in the cat kind, whose incisors, or cutting teeth, are very small, and whose grinding teeth, when brought together, touch more closely than those of the dog, and consequently have less power. Thus, for instance, I can squeeze any thing more forcibly between my thumb and fore-finger, where the distance is greater, than between any other two fingers, whose distance from each other is less.

This animal is capable of reproducing at the age of twelve months,[5] goes nine weeks with young, and lives to about the age of twelve years. Few quadrupeds are less delicate in their food, and yet there are many kinds of birds which the dog will not venture to touch. He is even known, although in a savage state, to abstain from injuring some, which one might suppose he had every reason to oppose. The dogs and the vultures which live wild about Grand Cairo in Egypt (for the Mahometan law has expelled this useful animal from human society) continue together in a very sociable and friendly manner.[6] As they are both useful in devouring such carcasses as might otherwise putrefy, and thus infect the air, the inhabitants supply them with provisions every day, in order to keep them near the city. Upon these occasions the quadrupeds and birds are often seen together, tearing the same piece of flesh, without the least enmity; on the contrary, they are known to live together with a kind of affection, and bring up their young in the same nest.

Although the dog is a voracious animal, yet he can bear hunger for a very long time. We have an instance in the Memoirs of the Academy of Sciences of this kind, in which a bitch, that had been forgotten in a country-house, lived forty days without any other nourishment than the wool of a quilt which she had torn in pieces. It should seem that water is more necessary to the dog than food; he drinks often, though not abundantly; and it is commonly believed, that, when abridged in water, he runs mad. This dreadful malady, the consequences of which are so well known, is the greatest inconvenience that results from the keeping of this faithful domestic. But it is a disorder by no means so frequent as the terrors of the timorous would suppose; the dog has been often accused of madness, without a fair trial; and some persons have been supposed to receive their deaths from his bite, when either their own ill-grounded fears, or their natural disorders, were the true cause.

THE WOLF.

The dog and the wolf are so very much alike internally, that the most expert anatomists can scarcely perceive the difference; and it may be asserted also, that externally some dogs more nearly resemble the wolf than they do each other. It was this strong similitude that first led some naturalists to consider them as the same animal, and to look upon the wolf as the dog in its state of savage freedom; however, this opinion is entertained no longer: the natural antipathy those two animals bear to each other; the longer time which the wolf goes with young than the dog, the one going over a hundred days, and the other not quite sixty;[7] the longer period of life in the former than the latter, the wolf living twenty years, the dog not fifteen; all sufficiently point out a distinction, and draw a line that must for ever keep them asunder.

The wolf, from the tip of the nose to the insertion of the tail, is about three feet seven inches long, and about two feet five inches high; which shows him to be larger than our great breed of mastiffs, which are seldom found to be above three feet by two. His colour is a mixture of black, brown, and gray, extremely rough and hard, but mixed towards the roots with a kind of ash-coloured fur. In comparing him to any of our well-known breed of dogs, the great Dane or mongrel greyhound for instance, he will appear to have the legs shorter, the head larger, the muzzle thicker, the eyes smaller, and more separated from each other, and the ears shorter and straighter. He appears in every respect stronger than the dog; and the length of his hair contributes still more to his robust appearance. The feature which principally distinguishes the visage of the wolf from that of the dog is the eye, which opens slantingly upwards in the same direction with the nose; whereas in the dog it opens more at right angles with the nose, as in man. The tail, also, in this animal, is long and bushy; and he carries it rather more between his hind legs than the dog is seen to do. The colour of the eyeballs in the wolf is of a fiery green, and gives his visage a fierce and formidable air, which his natural disposition does by no means contradict.[8]

[5] To this description I will beg leave to add a few particulars from Linnæus, as I find them in the original.—"Vomitua gramina purgatur; cacat supra lapidem. Album græcum antisepticum summum. Mingit ad latus (this, however, not till the animal is nine months old) cum hospite sæpe centies. Odorat anum alterius. Procis rixantibus crudelis menstruans coit cum variis. Mordet illa illos. Cohæret copula junctus."

[6] Hasselquist Iter. Palestin. p. 232.

[7] This is inaccurately stated. The female wolf goes with young 63 days, and has 8 or 9 in a litter. From the supposed difference in this particular between the dog and the wolf, an inference is drawn by Goldsmith that they are essentially different.—Ed.

[8] The rest of this history of the wolf is taken from Mr. Buffon; and I look upon it as a complete model for natural history. If I add or differ, I mark it as usual.

The wolf is one of those animals whose appetite for animal food is the most vehement; and whose means of satisfying this appetite are the most various. Nature has furnished him with strength, cunning, agility, and all those requisites which fit an animal for pursuing, overtaking, and conquering its prey; and yet, with all these, the wolf most frequently dies of hunger, for he is the declared enemy of man. Being long proscribed, and a reward offered for his head, he is obliged to fly from human habitations, and to live in the forest, where the few wild animals to be found there escape him either by their swiftness or their art; or are supplied in too small a proportion to satisfy his rapacity. He is naturally dull and cowardly; but frequently disappointed, and as often reduced to the verge of famine, he becomes ingenious from want, and courageous from necessity. When pressed with hunger, he braves danger, and comes to attack those animals which are under the protection of man, particularly such as he can readily carry away; lambs, sheep, or even dogs themselves, for all animal food becomes then equally agreeable. When this excursion has succeeded, he often returns to the charge, until having been wounded or hard pressed by the dogs or the shepherds, he hides himself by day in the thickest coverts, and only ventures out at night; he then sallies forth over the country, keeps peering round the villages, carries off such animals as are not under protection, attacks the sheepfolds, scratches up and undermines the thresholds of doors where they are housed, enters furious, and destroys all before he begins to fix upon and carry off his prey. When these sallies do not succeed, he then returns to the thickest part of the forest, content to pursue those smaller animals, which, even when taken, afford him but a scanty supply. He there goes regularly to work, follows by the scent, opens to the view, still keeps following, hopeless himself of overtaking the prey, but expecting that some other wolf will come in to his assistance, and then content to share the spoil. At last, when his necessities are very urgent, he boldly faces certain destruction; he attacks women and children, and sometimes ventures even to fall upon men, becomes furious by his continual agitations, and ends his life in madness.

The wolf, as well externally as internally, so nearly resembles the dog, that he seems modelled upon the same plan; and yet he only offers the reverse of the medal. If his form be like, his nature is so different, that he only preserves the ill qualities of the dog, without any of his good ones. Indeed, they are so different in their dispositions, that no two animals can have a more perfect antipathy to each other. A young dog shudders at the sight of a wolf; he even shuns his scent, which, though unknown, is so repugnant to his nature that he comes trembling to take protection near his master. A dog who is stronger, and who knows his strength, bristles up at the sight, testifies his animosity, attacks him with courage, and endeavours to put him to flight, and does all in his power to rid himself of a presence that is hateful to him. They never meet without either flying or fighting; fighting for life and death, and without mercy on either side. If the wolf is the stronger, he tears and devours his prey: the dog, on the contrary, is more generous, and contents himself with his victory; he does not seem to think that *the body of a dead enemy smells well;* he leaves him where he falls, to serve as food for birds of prey, or for other wolves, since they devour each other; and when one wolf happens to be desperately wounded, the rest track him by his blood, and are sure to show him no mercy.

The dog, even in his savage state, is not cruel; he is easily tamed, and continues firmly attached to his master. The wolf, when taken young, becomes tame, but never has an attachment. Nature is stronger in him than education; he resumes with age his natural dispositions, and returns as soon as he can to the woods from whence he was taken. Dogs, even of the dullest kinds, seek the company of other animals; they are naturally disposed to follow and accompany other creatures besides themselves; and even by instinct, without any education, take to the care of flocks and herds. The wolf, on the contrary, is the enemy of all society; he does not even keep much company with those of his kind. When they are seen in packs together, it is not to be considered as a peaceful society, but a combination for war; they testify their hostile intentions by their loud howlings, and, by their fierceness, discover a project for attacking some great animal, such as a stag or a bull, or to destroy some more redoubtable watch-dog. The instant their military expedition is completed, their society is at an end; they then part, and each returns in silence to his solitary retreat. There is not even any strong attachments between the male and female; they seek each other only once a-year, and remain but a few days together: they always couple in winter; at which time several males are seen following one female, and this association is still more bloody than the former; they dispute most cruelly, growl, bark, fight, and tear each other; and it sometimes happens that the majority kill the wolf which has been chiefly preferred by the female. It is usual for the she-wolf to fly from them all with him she has chosen; and watches this opportunity when the rest are asleep.

The season for coupling does not continue above twelve or fifteen days; and usually commences among the oldest, those which are young being later in their desires. The males have no fixed time for engendering; they pass from one female to the other, beginning at the end of December, and ending at the latter end of February. The time of pregnancy is about three months and a half; and the young wolves are found from the latter end of April to the beginning of July. The long continuance of the wolf's pregnancy is sufficient to make a distinction between it and the dog, did not also the fiery fierceness of the eyes, the howl instead of barking, and the greater duration of its life, leave no doubt of its being an animal of its own particular species. In other respects, however, they are entirely alike; the wolf couples exactly like the dog, the parts are formed in the same manner, and their separation hindered by the same cause. When the she-wolves are near their time of bringing forth, they seek some very tufted spot, in the thickest part of the forest; in the middle of this they make a small opening, cutting away the thorns and briars with their teeth, and afterwards carry thither a great quantity of moss, which they form into a bed for their young ones. They generally bring forth five or six, and sometimes even to nine at a litter. The cubs are brought forth, like those of the bitch, with the eyes closed; the dam suckles them for some weeks, and teaches them betimes to eat flesh, which she prepares for them by chewing it first herself. Some time after she brings them stronger food, hares, partridges, and birds yet alive. The young wolves begin by playing with them, and end by killing them. The dam then strips them of their feathers, tears them in pieces, and gives to each of them a share. They do not leave the den where they have been littered till they are six weeks or two months old. They then follow the old one, who leads them to drink to the trunk of some old tree, where the water has settled, or at some pool in the neighbourhood. If she apprehends any danger, she instantly conceals them in the first convenient place, or brings them back to their former retreat. In this manner they follow her for some months: when they are attacked, she defends them with all her strength, and more than usual ferocity. Although, at other times, more timorous than the male, at that season she becomes bold and fearless; willing perhaps to teach the young ones future courage by her own example. It is not till they are about ten or twelve months old, and until they have shed their first teeth, and completed the new, that she thinks them in a capacity to shift for themselves. Then, when they have acquired arms from Nature, and have learned industry and courage from her example, she declines all future care of them, being again engaged in bringing up a new progeny.

The males and females are in a capacity to engender when two years old. It is probable that the females of this species, as well as of most others, are sooner completed than the males; but this is certain, that they never desire to copulate until their second winter: from whence we may suppose that they live fifteen or twenty years; for allowing three years for their complete growth, this multiplied by seven, gives them a life of twenty-one; most animals, as has been observed, living about seven times the number of years which they take to come to perfection. Of this, however, there is as yet no certainty, no more than of what huntsmen assert, that in all the litters there are more males than females. From them also we learn, that there are some of the males who attach themselves to the female, who accompany her during her gestation, until the time of bringing forth, when she hides the place of her retreat from the male, lest he should devour her cubs. But after this, when they are brought forth, that he then takes the same care of them as the female, carries them provisions, and, if the dam should happen to be killed, rears them up in her stead.

The wolf grows gray as he grows old, and his teeth wear, like those of most other animals, by using. He sleeps when his belly is full, or when he is fatigued, rather by day than night; and always, like the dog, is very easily waked. He drinks frequently; and in times of drought, when there is no water to be found in the trunks of old trees, or in the pools about the forest, he comes often, in the day, down to the brooks or the lakes in the plain. Although very voracious, he supports hunger for a long time, and often lives four or five days without food, provided he be supplied with water.

The wolf has great strength, particularly in his fore parts, in the muscles of his neck and jaws. He carries off a sheep in his mouth without letting it touch the ground, and runs with it much swifter than the shepherds who pursue him; so that nothing but the dogs can overtake, and oblige him to quit his prey. He bites cruelly, and always with greater vehemence in proportion as he is least resisted; for he uses precautions with such animals as attempt to stand upon the defensive. He is ever cowardly, and never fights but when under the necessity of satisfying hunger, or making good his retreat. When he is wounded by a bullet, he is heard to cry out; and yet, when surrounded by the peasants, and attacked with clubs, he never howls as a dog under correction, but defends himself in silence, and dies as hard as he lived.

His nature is, in fact, more savage than that of the dog; he has less sensibility, and greater strength. He travels, runs, and keeps plundering for whole days and nights together. He is in a manner indefatigable; and perhaps of all animals he is the most difficult to be hunted down. The dog is good-natured and courageous; the wolf, though savage, is ever fearful. If he happens to be caught in a pit-fall, he is for some time so frightened and astonished, that he may be killed without offering to resist, or taken alive without much danger. At that instant one may clap a collar round his neck, muzzle him, and drag him along, without his ever giving the least signs of anger or resentment. At all other times he has his senses in great perfection; his eye, his ear, and particularly his sense of smelling, which is even superior to the two former. He smells a carcass at more than a league's distance; he also perceives living animals a great way off, and follows them a long time upon the scent. Whenever he leaves the wood, he always takes care to go out against the wind. When just come to its extremity, he stops to examine, by his smell, on all sides, the emanations that may come either from his enemy or his prey, which he very nicely distinguishes. He prefers those animals which he kills himself to those he finds dead; and yet he does not disdain these when no better is to be had. He is particularly fond of human flesh; and perhaps, if he were sufficiently powerful, he would eat no other. Wolves have been seen following armies, and arriving in numbers upon the field of battle, where they devoured such dead bodies as were left upon the field, or but negligently interred. These, when once accustomed to human flesh, ever after seek particularly to attack mankind, and choose to fall upon the shepherd rather than his flock. We have had a late instance of two or three of these keeping a whole province, for more than a month, in a continual alarm.

It sometimes happens that a whole country is called out to extirpate these most dangerous invaders. The hunting the wolf is a favourite diversion among the great of some countries; and it must be confessed it seems to be the most useful of any. These animals are distinguished by the huntsman into the *young wolf*, the *old wolf*, and the *great wolf*. They are known by the prints of their feet; the older the wolf, the larger the track he leaves. That of the female is narrower and longer than that of the male. It is necessary to have a very good starter to put up the wolf; and it is even convenient to use every art to encourage him in his pursuit; for all dogs have a natural repugnance against this animal, and are but cold in their endeavours. When the wolf is once put up, it is then proper to have greyhounds to let fly at him, in leashes, one after the other. The first leash is sent after him in the beginning, seconded by a man on horseback; the second are let loose about half-a-mile farther, and the third when the rest of the dogs come up with and begin to bait him. He for a long time keeps them off, stands his ground, threatens them on all sides, and often gets away; but usually the hunters arriving, come in aid of the dogs, and help to despatch him with their cutlasses. When the animal is killed, the dogs testify no appetite to enjoy their victory, but leave him where he falls, a frightful spectacle, and even in death hideous.

The wolf is sometimes also hunted with harriers; but as he always goes straight forward, and often holds his speed for a whole day together, this kind of chase is tedious and disagreeable, at least if the harriers are not assisted by greyhounds, who may harass him at every view. Several other arts have also been used to take and destroy this noxious animal. He is surrounded and wounded by men and large house-dogs; he is secured in traps; he is poisoned by carcasses prepared and placed for that purpose; and is caught in pitfalls. "Gesner tells us of a friar, a woman, and a wolf being taken in one of these, all in the same night. The woman lost her senses by the fright, the friar his reputation, and the wolf his life." All these disasters, however, do not prevent this animal's multiplying in great numbers, particularly in countries where the woods are plenty. France, Spain, and Italy, are greatly infested with them; but England, Ireland, and Scotland, are happily set free.

King Edgar is said to be the first who attempted to rid this kingdom of such disagreeable inmates, by commuting the punishment for certain crimes into the acceptance of a number of wolves' tongues from each criminal.[9] However, some centuries after, these animals were again increased to such a degree as to become the object of royal attention; accordingly Edward the First issued out his mandate to one Peter Corbet to superintend and assist in the destruction of them. They are said to have infested Ireland long after they were extirpated in England; however, the oldest men in that country remember nothing of these animals; and it is probable that there have been none there for more than a century past. Scotland also is totally free.[10]

The colour of this animal differs according to the different climates where it is bred, and often changes even in the same country. Besides the common wolves, which are found in France and Germany, there are others with thicker hair, inclining to yellow. These are more savage and less noxious than the former, neither approaching the flocks nor habitations, and living rather by the chase than rapine. In the northern climates there are found some quite black, and some white all over. The former are larger and stronger than those of any other kinds.

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[9] British Zoology, p. 62.

[10] The wolf was extirpated much earlier in England than in any other country of Europe. King Edgar, in the tenth century, according to the ancient chronicles, "tooke order for the destroying them throughout the whole realm." The Welsh paid tribute to Edgar, which he commuted for three hundred wolves' heads. Malmsbury says the tribute ceased on the fourth year, for want of wolves. It would appear from the writings of William Fitz-Stephen, the secretary of Thomas-a-Becket, that wolves did not exist in the great forests to the north of London, for he makes no mention of them in his account of it. "On the north are corn-fields, pastures, and delightful meadows, intermixed with pleasant streams, on which stands many a mill, whose clack is so grateful to the ear. Beyond them an immense forest extends itself, beautified with woods and groves, and full of the lairs and coverts of beasts and game,—stag, bucks, boars, and wild bulls." Wolves were found sufficiently numerous at a later period, again to demand the attention of the government; for Edward I., in the thirteenth century, issued his edict to "Maister Peter Corbet" to superintend their destruction. After this period we hear nothing of wolves in English history. Hollingshed mentions that, in 1577, wolves were very destructive to the flocks in Scotland; and it is said that the last of this ferocious race perished in Lochaber, by the hand of Sir Ewen Cameron, about a century afterwards. They were exterminated in Ireland at the beginning of the last century. —ED.

The species is very much diffused in every part of the world, being found in Asia, Africa, and in America, as well as in Europe. The wolves of Senegal resemble those of France, except that they are larger and much fiercer than those of Europe. Those of Egypt are smaller than those of Greece. In the East, the wolf is trained up for a show, being taught to dance and play tricks; and one of these thus educated often sells for four or five hundred crowns. "It is said that in Lapland the wolf will never attack a rein-deer that is seen haltered; for this wary animal, being well acquainted with the nature of a trap, suspects one whenever it perceives a rope. However, when he sees the deer entirely at liberty, he seldom fails to destroy it.

"The wolf of North America is blacker and much less than those in other parts of the world, and approaches nearer in form to the dog than those of the ordinary kind.[11] In fact, they were made use of as such by the savages, till the Europeans introduced others; and even now, on the remoter shores, or the more inland parts of the country, the savages still make use of these animals in hunting. They are very tame and gentle; and those of this kind that are wild are neither so large nor so fierce as an European wolf, nor do they ever attack mankind. They go together in large packs by night to hunt the deer, which they do as well as any dogs in England; and it is confidently asserted that one of them is sufficient to run down a deer.[12] Whenever they are seen along the banks of those rivers near which the wandering natives pitch their huts, it is taken for granted that the bison or the deer are not far off; and the savages affirm that the wolves come with the tidings, in order to have the garbage, after the animal has been killed by the hunters. Catesby adds a circumstance relative to these animals, which, if true, invalidates many of Mr. Buffon's observations in the foregoing history. He asserts, that these being the only dogs used by the Americans, before the arrival of the Europeans among them, they have since engendered together, and that their breed has become prolific; which proves the dog and the wolf to be of the same species. It were to be wished that this fact were better ascertained; we should then know to a certainty in what degree the dog and wolf resemble each other, as well in nature as in conformation; we might then, perhaps, be enabled to improve the breed of our dogs, by bringing them back to their native forms and instincts; we might, by crossing the strain, restore that race of those bold animals, which the ancients assure us were more than a match for the lion."

However this animal may be useful in North America, the wolf of Europe is a very noxious animal, and scarcely any thing belonging to him is good, except his skin. Of this the furriers make a covering that is warm and durable, though coarse and unsightly. His flesh is very indifferent, and seems to be disliked by all other animals, no other creature being known to eat the wolf's flesh except the wolf himself. He breathes a most fœtid vapour from his jaws, as his food is indiscriminate, often putrid, and seldom cleanly. In short, every way offensive, a savage aspect, a frightful howl, an insupportable odour, a perverse disposition, fierce habits, he is hateful while living, and useless when dead.[13]

THE FOX.

The fox very exactly resembles the wolf and the dog internally: and although he differs greatly from both in size and carriage, yet when we come to examine their shapes minutely, there will appear to be very little difference in the description. Were, for instance, a painter to draw from a natural historian's exactest description the figure of a dog, a wolf, and a fox, without having ever seen either, he would be very apt to confound all these animals together; or rather he would be unable to catch those peculiar outlines that no description can supply. Words will never give any person an exact idea of forms any way irregular; for although they be extremely just and precise, yet the numberless discriminations to be attended to will confound each other, and we shall no more conceive the precise form than we should be able to tell when one pebble more was added or taken away from a thousand. To conceive, therefore, how the fox differs in form from the wolf or the dog, it is necessary to see all three, or at least to supply the defects of description by examining the difference in a print.

The fox is of a slenderer make than the wolf, and not near so large; for as the former is above three feet and a half long, so the other is not above two feet three inches. The tail of the fox also is longer in proportion, and more bushy; its nose is smaller, and approaching more nearly to that of the greyhound, and its hair softer. On the other hand, it differs from the dog in having its eyes obliquely situated, like those of the wolf; its ears are directed also in the same manner as those of the wolf, and its head is equally large in proportion to its size. It differs still more from the dog in its strong offensive smell, which is peculiar to the species, and often the cause of their death. However, some are ignorantly of opinion that it will keep off infectious diseases, and they preserve this animal near their habitations for that very purpose.

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[11] Brookes's Natural History, vol. i. p. 198.

[12] Dictionaire Raisonnée, *Loup*.

[13] See Supplementary Note B, p. 408.

The fox has since the beginning been famous for his cunning and his arts, and he partly merits his reputation.[14] Without attempting to oppose either the dogs or the shepherds, without attacking the flock or alarming the village, he finds an easier way to subsist, and gains by his address what is denied to his strength or courage. Patient and prudent, he waits the opportunity for depredation, and varies his conduct with every occasion. His whole study is his preservation; although nearly as indefatigable, and actually more swift than the wolf, he does not entirely trust to either, but makes himself an asylum, to which he retires in case of necessity; where he shelters himself from danger, and brings up his young.

As among men, those who lead a domestic life are more civilized and more endued with wisdom than those who wander from place to place; so in the inferior ranks of animated nature, the taking possession of a home supposes a degree of instinct which others are without.[15] The choice of the situation for this domicile, the art of making it convenient, of hiding its entrance, and securing it against more powerful animals, are all so many marks of superior skill and industry. The fox is furnished with both, and turns them to his advantage. He generally keeps his kennel at the edge of the wood, and yet within an easy journey of some neighbouring cottage. From thence he listens to the crowing of the cock, and the cackling of the domestic fowls. He scents them at a distance; he seizes his opportunity, conceals his approaches, creeps slyly along, makes the attack, and seldom returns without his booty. If he be able to get into the yard, he begins by levelling all the poultry without remorse; and carrying off a part of the spoil, hides it at some convenient distance, and again returns to the charge. Taking off another fowl in the same manner, he hides that also, but not in the same place; and this he practises for several times together, until the approach of day, or the noise of the domestics, give him warning to retire. The same arts are practised when he finds birds entangled in springes laid for them by the fowler; the fox takes care to be beforehand, very expertly takes the bird out of the snare, hides it for three or four days, and knows very exactly when and where to return to avail himself of his hidden treasure. He is equally alert in seizing the young hares and rabbits before they have strength enough to escape him; and when the old ones are wounded and fatigued, he is sure to come upon them in their moments of distress, and to show them no mercy. In the same manner he finds out birds' nests, seizes the partridge and the quail while sitting, and destroys a large quantity of game. The wolf is most hurtful to the peasant, but the fox to the gentleman. In short, nothing that can be eaten seems to come amiss; rats, mice, serpents, toads, and lizards. He will, when urged by hunger, eat vegetables and insects; and those that live near the sea-coasts will, for want of other food, eat crabs, shrimps, and shell-fish. The hedge-hog in vain rolls itself up into a ball to oppose him: this determined glutton teases it until it is obliged to appear uncovered, and then he devours it. The wasp and the wild-bee are attacked with equal success. Although at first they fly out upon their invader, and actually oblige him to retire, this is but for a few minutes, until he has rolled himself upon the ground, and thus crushed such as stick to his skin; he then returns to the charge, and at last by perseverance, obliges them to abandon their combs; which he greedily devours, both wax and honey.

The chase of the fox requires less preparation than that of the wolf, and it is also more pleasant and amusing.[16] As dogs have a natural repugnance to pursue the wolf, so they are equally alert in following the fox; which chase they prefer even to that of the hare or the buck. The huntsmen, as upon other occasions, have their cant terms for every part of this chase. The fox the first year is called *a cub;* the second, *a fox;* and the third, an *old fox;* his tail is called the *brush* or *drag;* and his excrement, the *billiting*. He is usually pursued by a large kind of harrier or hound, assisted by terriers, or a smaller breed, that follow him into his kennel, and attack him there. The instant he perceives himself pursued, he makes to his kennel, and takes refuge at the bottom of it, where for a while he loses the cry of his enemies; but the whole pack coming to the mouth, redouble their vehemence and rage, and the little terrier boldly ventures in. It often happens that the kennel is made under a rock, or among the roots of old trees; and in such cases the fox cannot be dug out, nor is the terrier able to contend with him at the bottom of his hole. By this contrivance he continues secure; but when he can be dug out, the usual way is to carry him in a bag to some open country, and there set him loose before the hounds. The hounds and the men follow, barking and shouting wherever he runs; and the body being strongly employed, the mind has not time to make any reflection on the futility of the pursuit. What adds to this entertainment is the strong scent which the fox leaves, that always keeps up a full cry; although as his scent is stronger than that of the hare, it is much sooner evaporated. His shifts to escape, when all retreat is cut off to his kennel, are various and surprising. He always chooses the most woody country, and takes those paths that are most embarrassed with thorns and briars. He does not double, nor use the unavailing shifts of the hare; but flies in a direct line before the hounds, though at no very great distance; manages his strength; takes to the low and plashy grounds, where the scent will be less apt to lie; and at last, when overtaken, he defends himself with desperate obstinacy, and fights in silence to the very last gasp.

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[14] Buffon, *Renard*.

[15] Ibid.

[16] "Melton Mowbray, a small town in Leicestershire, generally contains from two to three hundred hunters, in the hands of the most experienced grooms England can produce, the average number being ten to each sportsman residing there, although some of those who ride heavy, and rejoice in long purses, have from fourteen to twenty for their own use. The stud of the earl of Plymouth has, for many years, exceeded the last mentioned number. It may seem strange that one man should, under any circumstances, need so large a number of horses solely for his personal use in the field; and it must be admitted that few countries do require it. In Leicestershire, however, the universal practice is, for each sportsman to have at least two hunters in the field on the same day—a practice proved to be economical, as it is from exhaustion, the effect of long continued severe work, that the health of horses is most injured. And when it is considered that a horse should always have five days' rest after a moderate, and at least seven or eight after a severe run with hounds, it will not seem surprising that ten or twelve hunters should be deemed an indispensable stud for a regular Leicestershire sportsman. The sum total of expenses attending a stud of twelve hunters at Melton, including every outgoing, is, as nearly as can be estimated, £1,000 per annum. In all stables, the outlay for the purchase of horses is great—at least two hundred guineas each hunter; and, in some, the annual amount of tear and wear of horse flesh is considerable. Melton has been much improved owing to the numbers of comfortable houses which have been erected for the accommodation of its sporting visitors, who spend not less, on an average, than £50,000 per annum on the spot. It stands on one of the great north roads, eighteen miles from Nottingham, and fifteen from Leicester, which latter place is also a favourite resort of sportsmen. The town furnishes an interesting scene on each hunting morning. At rather an early hour are to be seen groups of hunters, the finest in the world, setting out in different directions to meet different packs of hounds. The *style* of your Meltonian fox-hunter has long distinguished him above his brethren of what he calls the *provincial* chase When turned out of the hands of his valet, he presents the very *beau-ideal* of his *caste*. The exact Stultze-like fit of his coat—his superlatively well-cleaned breeches and boots—and the generally ap-

The fox, though resembling the dog in many respects, is nevertheless very distinct in his nature, refusing to engender with it; and though not testifying the antipathy of the wolf, yet discovering nothing more than indifference. This animal also brings forth fewer at a time than the dog, and that but once a-year. Its litter is generally from four to six, and seldom less than three. The female goes with young about six weeks, and seldom stirs out while pregnant, but makes a bed for her young, and takes every precaution to prepare for their production. When she finds the place of their retreat discovered, and that her young have been disturbed during her absence, she removes them one after the other in her mouth, and endeavours to find them out a place of better security. A remarkable instance of this animal's parental affection happened while I was writing this history, in the county of Essex. A she-fox that had, as it should seem, but one cub, was unkenneled by a gentleman's hounds near Chelmsford, and hotly pursued. In such a case, when her own life was in imminent peril, one would think it was not a time to consult the safety of her young; however, the poor animal, braving every danger, rather than leave her cub behind to be worried by the dogs, took it up in her mouth, and ran with it in this manner for some miles. At last, taking her way through a farmer's yard, she was assaulted by a mastiff, and at last obliged to drop her cub which was taken up by the farmer. I was not displeased to hear that this faithful creature escaped the pursuit, and at last got off in safety. The cubs of the fox are born blind, like those of the dog; they are eighteen months or two years in coming to perfection, and live about twelve or fourteen years.

As the fox makes war upon all animals, so all others seem to make war upon him. The dog hunts him with peculiar acrimony; the wolf is still a greater and more necessitous enemy, who pursues him to his very retreat. Some pretend to say that, to keep the wolf away, the fox lays at the mouth of its kennel a certain herb, to which the wolf has a particular aversion. This, which no doubt is a fable, at least shows that these two animals are as much enemies to each other as to all the rest of animated nature. But the fox is not hunted by quadrupeds alone; for the birds, who know him for their mortal enemy, attend him in his excursions, and give each other warning of their approaching danger. The daw, the magpie, and the blackbird, conduct him along, perching on the hedges as he creeps below, and, with their cries and notes of hostility, apprize all other animals to beware; a caution which they perfectly understand, and put into practice. The hunters themselves are often informed by the birds of the place of his retreat, and set the dogs into those thickets where they see them particularly noisy and querulous. So that it is the fate of this petty plunderer to be detested by every rank of animals; all the weaker classes shun, and all the stronger pursue him.

The fox, of all wild animals, is most subject to the influence of climate; and there are found as many varieties in this kind almost as in any of the domestic animals.[17] The generality of foxes, as is well known, are red; but there are some, though not in England, of a grayish cast; and Mr. Buffon asserts, that the tip of the tail in all foxes is white; which, however, is not so in those of this country. There are only three varieties of this animal in Great Britain, and

parent high-breeding of the man, can seldom be matched elsewhere; and the most cautious sceptic in such points would satisfy himself of the fact at one single inspection."—*Quarterly Review.*

[17] Buffon, *Renard*

these are rather established upon a difference of size than of colour or form. The greyhound fox is the largest, tallest, and boldest; and will attack a grown sheep. The mastiff fox is less, but more strongly built. The cur fox is the least and most common; he lurks about hedges and out-houses, and is the most pernicious of the three to the peasant and the farmer.

In the colder countries round the pole, the foxes are of all colours; black, blue, gray, iron-gray, silver-gray, white, white with red legs, white with black heads, white with the tip of the tail black, red with the throat and belly entirely white, and lastly with a stripe of black running along the back, and another crossing it at the shoulders.[18] The common kind, however, is more universally diffused than any of the former, being found in Europe, in the temperate climates of Asia, and also in America; they are very rare in Africa, and in the countries lying under the torrid zone. Those travellers who talk of having seen them at Calicut, and other parts of Southern India, have mistaken the jackal for the fox. The fur of the white fox is held in no great estimation, because the hair falls off. The blue fox-skins are bought up with great avidity, from their scarceness; but the black fox-skin is of all others the most esteemed, a single skin often selling for forty or fifty crowns. The hair of these is so disposed, that it is impossible to tell which way the grain lies; for if we hold the skin by the head, the hair hangs to the tail; and if we hold it by the tail, it hangs down equally smooth and even to the head. These are often made into men's muffs, and are at once very beautiful and warm. In our temperate climate, however, furs are of very little service, there being scarce any weather so severe in England from which our ordinary clothes may not very well defend us.

THE JACKAL.

THE jackal is one of the commonest wild animals in the East; and yet there is scarcely any less known in Europe, or more confusedly described by natural historians. In general, we are assured that it resembles the fox in figure and disposition, but we are still ignorant of those nice distinctions by which it is known to be of a different species. It is said to be of the size of a middling dog, resembling the fox in the hinder parts, particularly the tail; and the wolf in the fore parts, especially the nose. Its legs are shorter than those of the fox, and its colour is of a bright yellow, or sorrel, as we express it in horses. This is the reason it has been called in Latin the *golden wolf;* a name, however, which is entirely unknown in the countries where they are most common.

The species of the jackal is diffused all over Asia, and is found also in most parts of Africa, seeming to take up the place of the wolf, which, in those countries, is not so common. There seem to be many varieties among them: those of the warmest climates appear to be the largest, and their colour is rather of a reddish brown, than of that beautiful yellow by which the smaller jackals are chiefly distinguished.

Although the species of the wolf approaches very near to that of the dog, yet the jackal seems to be placed between them; to the savage fierceness of the wolf, it adds the impudent familiarity of the dog.[19] Its cry is a howl, mixed with barking, and a lamentation resembling that of human distress. It is more noisy in its pursuits even than the dog, and more voracious than the wolf. The jackal never goes alone, but always in a pack of forty or fifty together. These unite regularly every day to form a combination against the rest of the forest. Nothing then can escape them; they are content to take up with the smallest animals; and yet, when thus united, they have courage to face the largest. They seem very little afraid of mankind, but pursue their game to the very doors, without testifying either attachment or apprehension. They enter insolently into the sheep-folds, the yards, and the stables; and when they can find nothing else, devour the leather-harness, boots, and shoes, and run off with what they have not time to swallow.

They not only attack the living but the dead. They scratch up with their feet the new-made graves, and devour the corpse how putrid soever. In those countries, therefore, where they abound, they are obliged to beat the earth over the grave, and to mix it with thorns, to prevent the jackals from scraping it away. They always assist each other, as well in this employment of exhumation, as in that of the chase. While they are at this dreary work, they exhort each other by a most mournful cry, resembling that of children under chastisement; and when they have thus dug up the body, they share it amicably between them. These, like all other savage animals, when they have once tasted of human flesh, can never after refrain from pursuing mankind. They watch the burying-grounds, follow armies, and keep in the rear of caravans. They may be considered as the vulture of the quadruped kind; every thing that once had animal life seems equally agreeable to them; the most putrid substances are greedily devoured; dried leather, and anything that has been rubbed with grease, how insipid soever in itself, is sufficient to make the whole go down.

They hide themselves in holes by day, and seldom appear abroad till night-fall, when the jackal that has first hit upon the scent of some larger beast gives notice to the rest by a howl, which it repeats as it runs; while all the rest that are within hearing pack in to its assistance. The gazelle, or whatever other beast it may be, finding itself pursued, makes off towards the houses and the towns; hoping, by that means, to deter its pursuers from following; but hunger gives the jackal the same degree of boldness that fear gives the gazelle, and it pursues even to the verge of the city, and often along the streets. The gazelle, however, by this means most frequently escapes; for the inhabitants sallying out, often disturb the jackal in the chase; and as it hunts by the scent, when once driven off, it never recovers it again. In this manner we see how experience prompts the gazelle, which is naturally a very timid animal, and particularly fearful of man, to take refuge near him, considering him as the least dangerous enemy, and often escaping by his assistance.

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[18] Buffon, *Renard.*

[19] Buffon, vol. xxvii. p. 52.

But man is not the only intruder upon the jackal's industry and pursuits. The lion, the tiger, and the panther, whose appetites are superior to their swiftness, attend to its call, and follow in silence at some distance behind.[20] The jackal pursues the whole night with unceasing assiduity, keeping up the cry, and with great perseverance at last tires down its prey: but just at the moment it supposes itself going to share the fruits of its labour, the lion or the leopard comes in, satiates himself upon the spoil, and his poor provider must be content with the bare carcass he leaves behind. It is not to be wondered at, therefore, if the jackal be voracious, since it so seldom has a sufficiency; nor that it feeds on putrid substances, since it is not permitted to feast on what it has newly killed. Besides these enemies, the jackal has another to cope with; for between him and the dog there is an irreconcilable antipathy, and they never part without an engagement. The Indian peasants often chase them as we do foxes;[21] and have learned by experience, when they have got a lion or a tiger in their rear. Upon such occasions they keep their dogs close, as they would be no match for such formidable animals, and endeavour to put them to flight with their cries. When the lion is dismissed, they more easily cope with the jackal, who is as stupid as it is impudent, and seems much better fitted for pursuing than retreating. It sometimes happens that one of them steals silently into an out-house, to seize the poultry, or devour the furniture; but hearing others in full cry at a distance, without thought it instantly answers the call, and thus betrays its own depredations. The peasants sally out upon it, and the foolish animal finds, too late, that its instinct was too powerful for its safety.[22]

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[20] Linnæi Systema, p. 60.

[21] "The Calcutta Hunt has existed since the year 1820. The kennels, situate at Alipore, the southern suburb of Calcutta, in convenience, extent, and appearance, might vie with the best in the mother-country. Thirty couples of hounds, selected from the draughts of the best kennels in England, are annually imported at a cost of 200 to 250 rupees (£20 to £25) per couple. The season commences in November and ends in April; the pack meets also in the first month of the rainy season, June. The sport is commenced very early in the morning, and is concluded before the sun gains power. The chase-loving Anglo-Indian rises by candle-light, drives himself to cover either at Dum-Dum or Gowripore, a distance of eight or nine miles, where the hounds, having also performed their journey on a spring-van, throw off at sun-rise (half-past five), and probably finish their second jackal by nine o'clock, returning home to breakfast by ten. The substitute for the English fox is the jackal, somewhat larger in size, and, when fairly put to the stretch, nowise inferior in speed; his nature, too, is similar, as he partakes of the love for poultry so strongly displayed in his English prototype. The country, technically so called, consists of plains, or generally cultivated gardens, raised, to avoid the inundation consequent on the rainy season; jungles of bamboos densely planted, on which the Indian village is situated, and which requires no small skill on the part of the rider and hounds to thread when going the pace. Large ditches form the boundaries of the different gardens, of bamboo-rails, about the height of an English sheep-hurdle. The breeding of hounds is impracticable in India from the character of the climate; even out of the importations, few of the couples of one season survive the next."—*Fisher's Colonial Magazine.*

[22] The jackal has been popularly called the lion's provider. The common notion that he is in confederacy with the lion, for the chase of their mutual prey, is an erroneous one. At the cry of the jackal, echoed as it is by hundreds of similar voices through the woods and arid plains, the lion, whose ear is dull, rouses himself into action. He knows that some unhappy wanderer from the herds has crossed the path of the jackal, and he joins in the pursuit. Of this nocturnal cry we have read the most fearful accounts. "The chacal's shriek" has been often described as more terrific than the howl of the hyæna, or the roar of the tiger; and it probably is most alarming, from its singular dreariness, amidst the lonely regions in which it is heard. It is well described in Captain Beechy's account of his Expedition to explore the Northern Coasts of Africa:—"The cry of the jackal has something in it rather appalling, when heard for the first time at night; and as they usually come in packs, the first shriek which is uttered is always the signal for a general chorus. We hardly know a sound which partakes less of harmony than that which is at present in question; and, indeed, the sudden burst of the answering long-protracted scream, succeeding immediately to the opening-note, is scarcely less impressive than the roll of the thunder-clap immediately after a flash of lightning. The effect of this music is very much increased when the first note is heard in the distance (a circumstance which often occurs), and the answering yell bursts out from several points at once, within a few yards, or feet, of the place where the auditors are sleeping." The difficulty of domesticating the jackal, if it were desirable, would arise from two causes. The one is the strong odour which he emits, as filthy as that of the fox; and yet it is said that the skunk (a species of civet) loses its offensive smell in captivity. The other cause is the extreme timidity of the jackal at the sight of a stranger; he flies when he is approached, although he attempts no resistance when touched. This is, perhaps, a peculiarity arising out of confinement; for Captain Beechy says, that he has frequently gone close up within a few yards of a jackal in the wild state, before he would turn to walk away.—Ed.

THE ISATIS.

As the jackal is a sort of intermediate species between the dog and the wolf,[23] so the isatis may be considered as placed between the dog and the fox. This animal has hitherto been supposed to be only a variety of the latter; but from the latest observations, there is no doubt of their being perfectly distinct. The isatis is very common in all the northern countries bordering upon the Icy sea; and is seldom found, except in the coldest countries. It extremely resembles the fox, in the form of its body and the length of its tail; and a dog, in the make of its head and the position of its eyes. The hair of these animals is softer than that of a common fox; some are blue, some are white at one season and at another of a russet brown. Although the whole of its hair be two inches long, thick, tufted, and glossy, yet the under jaw is entirely without any, and the skin appears bare in that part.

This animal can bear only the coldest climates, and is chiefly seen along the coasts of the Icy sea, and upon the banks of the great rivers that discharge themselves therein. It is chiefly fond of living in the open country, and seldom seen in the forest, being mostly found in the mountainous and naked regions of Norway, Siberia, and Lapland. It burrows like the fox; and, when with young, the female retires to her kennel, in the same manner as the fox is seen to do. These holes, which are very narrow, and extremely deep, have many outlets. They are kept very clean, and are bedded at the bottom with moss, for the animal to be more at its ease. Its manner of coupling, time of gestation, and number of young, are all similar to what is found in the fox; and it usually brings forth at the end of May or the beginning of June.

Such are the particulars in which this animal differs from those of the dog kind, and in which it resembles them; but its most striking peculiarity remains still to be mentioned; namely, its changing its colour, and being seen at one time brown, and at another perfectly white. As was already said, some are naturally blue, and their colour never changes; but such as are to be white, are, when brought forth, of a yellow hue, which, in the beginning of September, is changed to white, all except along the top of the back, along which runs a stripe of brown, and another crossing it down the shoulders, at which time the animal is called the *crossed fox;* however, this brown cross totally disappears before winter, and then the creature is all over white, and its fur is two inches long; this, about the beginning of May, again begins to fall; and the moulting is completed about the middle of July, when the isatis becomes brown once more. The fur of this animal is of no value, unless it be killed in winter.

THE HYÆNA.

THE hyæna is the last animal I shall mention among those of the dog kind, which it, in many respects, resembles, although too strongly marked to be strictly reduced to any type. The hyæna is nearly of the size of a wolf; and has some similitude to that animal in the shape of its head and body. The head, at first sight, does not appear to differ, except that the ears of the hyæna are longer, and more without hair; but, upon observing more closely, we shall find the head broader, the nose flatter, and not so pointed. The eyes are not placed obliquely, but more like those of a dog. The legs, particularly the hinder, are longer than those either of the dog or the wolf, and different from all other quadrupeds, in having but four toes, as well on the fore-feet as on the hinder. Its hair is of a dirty grayish, marked with black, disposed in waves down its body. Its tail is short, with pretty long hair; and immediately under it, above the anus, there is an opening into a kind of glandular pouch, which separates a substance of the consistence, but not of the odour, of civet. This opening might have given rise to the error of the ancients, who asserted that this animal was every year alternately male and female. Such are the most striking distinctions of the hyæna, as given us by naturalists; which, nevertheless, convey but a very confused idea of the peculiarity of its form. Its manner of holding the head seems remarkable; somewhat like a dog pursuing the scent, with the nose near the ground. The head being held thus low, the back appears elevated, like that of the hog, which, with a long bristly band of hair that runs all along, gives it a good deal the air of that animal; and it is probable that from this similitude it first took its name; the word *huaina* being Greek, and derived from *hus*, which signifies a *sow*.

But no words can give an adequate idea of this animal's figure, deformity, and fierceness; more savage and untameable than any other quadruped, it seems to be for ever in a state of rage or rapacity, for ever growling, except when receiving its food. Its eyes then glisten, the bristles of its back all stand upright, its head hangs low, and yet its teeth appear; all which give it a most frightful aspect, which a dreadful howl tends to heighten. This, which I have often heard, is very peculiar: its beginning resembles the voice of a man moaning, and its latter part as if he were making a violent effort to vomit. As it is loud and frequent, it might, perhaps, have been sometimes mistaken for that of a human voice in distress, and have given rise to the accounts of the ancients, who tell us, that the hyæna makes its moan to attract unwary travellers, and then to destroy them: however this be, it seems the most untractable, and, for its size, the most terrible of all other quadrupeds; nor does its courage fall short of its ferocity; it defends itself against the lion, is a match for the panther, attacks the ounce, and seldom fails to conquer.

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[23] In this description I have followed Mr. Buffon.

It is an obscene and solitary animal, to be found chiefly in the most desolate and uncultivated parts of the torrid zone, of which it is a native.[24] It resides in the caverns of mountains, in the clefts of rocks, or in dens that it has formed for itself under the earth. Though taken never so young, it cannot be tamed; it lives by depredation, like the wolf, but is much stronger, and more courageous.—It sometimes attacks man, carries off cattle, follows the flock, breaks open the sheep-cots by night, and ravages with insatiable voracity. Its eyes shine by night; and it is asserted, not without great appearance of truth, that it sees better by night than by day. When destitute of other provision, it scrapes up the graves, and devours the dead bodies, how putrid soever. To these dispositions, which are sufficiently noxious and formidable, the ancients have added numberless others, which are long since known to be fables: as, for instance, that the hyæna was male and female alternately; that having brought forth and suckled its young, it then changed sexes for a year, and became a male. This, as was mentioned above, could only proceed from the opening under the tail, which all animals of this species are found to have; and which is found in the same manner in no other quadrupeds, except the badger. There is, in the weasel kind indeed, an opening, but it is lower down, and not placed above the anus, as in the badger and the hyæna. Some have said that this animal changed the colour of its hair at will; others, that a stone was found in its eye, which, put under a man's tongue, gave him the gift of prophecy; some have said that it had no joints in the neck, which, however, all quadrupeds are known to have; and some, that the shadow of the hyæna kept dogs from barking. These, among many other absurdities, have been asserted of this quadruped; and which I mention to show the natural disposition of mankind, to load those that are already but too guilty with accumulated reproach.[25]

Note A.—*Varieties of the Dog kind.*

The very extensive varieties of the dog, which have been produced by domestication and other causes, have led naturalists into great differences of opinion, as to the original stock from which these varieties have sprung. Wild dogs as they are at present found, are, in most cases, dogs without masters; living in a miserable condition, away from human society, and easily won back to its subjection and its comforts: these, therefore, do not advance our inquiries, as to the original type of the species in a state of nature. Some think the dog is a jackal, some a wolf. In the character of erect ears, many of our domestic dogs nearly resemble the half-reclaimed varieties, such as the Esquimaux; and again, others, in the shape of the head, approach more nearly to the Australasian dog, which has been lately considered as retaining most of the probable distinctive characters of the wild and original stock. M. F. Cuvier, has directed much attention to this subject; and he has constructed a list of dogs, arranged, as he conceives, in the order of their approach to the parent stock as far as that can be determined by the shape of the head, and the length of the jaws and muzzle. We subjoin this arrangement, which varies greatly from that of Buffon, and certainly appears much more natural and reasonable.

All the varieties of the dog, according to M. F. Cuvier, may be divided into three groups, viz.:—

I. Matins.
II. Spaniels.
III. Dogues.

I. Matins.—The anatomical character of this group is,—the head more or less elongated; the parietal bones insensibly approaching each other; and the condyles of the lower jaw placed in a horizontal line with the upper cheek teeth.

Var. A.—Dog of New Holland.—*Canis fam. Australasiæ*, Desmarest; *Dingo*, Shaw.

Var. B.—French Matin.—*Canis fam. laniarius*, Linnæus; *Matin*, Buffon.

(According to Buffon, this dog, a native of temperate climates, becomes the Danish dog when carried to the north, and the greyhound, when under the influence of a southern climate.)

Var. C.—Danish Dog.—*Canis fam. Danicus*, Desmarest; *Grand Danois*, Buffon.

Var. D.—Greyhound.—*Canis graius*, Linnæus; *Levrier*, Buffon.

This variety includes the following *sub-varieties*:

a. Irish Greyhound.
b. Scotch Greyhound.
c. Russian Greyhound.
d. Italian Greyhound.
e. Turkish Greyhound.

(The Italian and the Turkish greyhounds are alike in the great timidity of their dispositions, and their constant trembling proceeding probably from excessive sensibility. The common greyhound is feelingly alive to caresses; and the motions of his heart, when noticed, are most violent and irregular.)

The *Albanian* dog, a very celebrated species described by many historians, belongs to this group.

II. Spaniels.—The head very moderately elongated; the parietal bones do not approach each other above the temples, but diverge and swell out so as to enlarge the forehead and the cerebral cavity. This group includes the most useful and intelligent of dogs.

Var. E.—Spaniel.—*Canis fam. extrarius*, Linnæus.

(The name of this race is derived from its original country, Spain; thence Epagneul, French; Spaniel, English.)

Sub-varieties.

a. The smaller Spaniel.
b. King Charles's Spaniel.—*Canis brevipilis*, Linnæus.
c. *Le Pyrame*, Buffon.—(There is no English name for this kind.)
d. The Maltese Dog.—*Bichon*, Buffon.
e. The Lion Dog.—*Canis leoninus*, Linnæus.
f. The Calabrian Dog.

Var. F. The Water-Spaniel.—*Canis aquaticus*, Linnæus; *Chien barbet*, Buffon.

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[24] Buffon.
[25] See Supplementary Note C, p. 409.

Sub-varieties.

a. Small Water-Spaniel.—*Petit barbet*, Buffon.

(According to Buffon and Daubenton, this is considered the offspring of the great water-dog and the little spaniel.)

b. Chien Griffon.—This is a sub-variety between the water-spaniel and shepherd's dog.

Var. G.—The Hound.—*Chien Courant*, Buffon; *Canis sagax*, Linnæus.

(This is essentially the same as the blood-hound. The fox-hound is a smaller variety, and the harrier a still smaller. The beagle is a particular breed of the harrier. The "Talbot" is an old English name for all the varieties of the hound.)

Var. H.—The Pointer.—*Canis avicularius*, Linn.

Sub-varieties.

a. Dalmatian Pointer.—*Braque de Bengal.*—Buffon.

Var. I.—Turnspit.—*Canis fam. vertagus*, Linnæus.

(There are two sub-varieties, one with the fore-legs straight, the other crooked.)

Var. K.—Shepherd's Dog.—*Canis fam. domesticus*, Linnæus.

Var. L.—Wolf Dog.—*Canis pomeranus*, Linnæus.

Var. M.—Siberian Dog.—*Canis Sibericus*, Linn.

Var. N.—Esquimaux Dog.—*Canis fam. Borealis*, Desmarest.

Var. O.—The Alco.

In group II. ought to be included—

The Alpine Spaniel.
The Newfoundland Dog.
The Setter.
The Terrier.

These are omitted by M. F. Cuvier; but the two first are alluded to in a note by M. Desmarest in his "Mammalogie. The French call the various mongrel breeds *chiens de rue*—dogs of the street.

III. Dogues.—The muzzle more or less shortened; the skull high; the frontal sinuses considerable; the condyle of the lower jaw extending above the line of the upper cheek-teeth. The cranium is smaller in this group than in the two previous, owing to the formation of the head.

Var. P.—Bull-Dog.—*Canis fam. molossus*, Linnæus. *Sub-variety.*—Dog of Thibet.

Var. Q.—The Mastiff.—*Canis fam. Anglicus*, Linn.

Var. R.—The Pug-Dog.—*Le doguin*, Buffon.

Var. S.—The Iceland Dog.—*Canis fam. islandicus*, Linnæus.

Var. T.—Little Danish Dog.—*Canis fam. variegatus*, Linnæus.

(When spotted with black on a white ground it is called the Harlequin Dog. Notwithstanding the name there is no resemblance of form between this and the Danish Dog, *var.* C.)

Var. U.—Bastard Pug.—*Chien roquet*, Buffon.

Var. V.—*Canis fam. Britannicus*, Desmarest.—A variety between the little Danish dog and the Pyrame.

Var. X.—Artois dog, an extinct variety of the *Canis fam. fricator of* Linnæus.

Var. Y.—Dog of Andalusia, sometimes called the Dog of Cayenne.

Var. Z.—Barbary Dog.—*Chien turc*, Buffon; *Canis fam. Ægyptius*, Linnæus.

(There are two varieties; one quite naked, the other with a mane.)

Following the above arrangement, we proceed to give short notices of the numerous varieties of the dog.

DIVISION I.

HEAD ELONGATED.

HALF-RECLAIMED DOGS WHICH HUNT IN PACKS.

The Dingo or New-Holland dog.—The head of the New-Holland dog is much elongated, and tapers abruptly towards the muzzle, having much the appearance of a fox, with short erect ears. In the general proportions of the body he resembles the shepherd's dog. His body is thick with hair; his tail bushy: the hair is of two sorts; one woolly and gray, the other silky and of a deep yellow. The colour is deepest on the top of the head, and on the upper parts of the neck and tail, and the back: the under parts of the neck and tail are paler: the muzzle and face, and the inner side of the hams, are whitish. The tail has eighteen vertebræ (dogs in general have nineteen). The length of the carcass, from the point of the nose to the commencement of the tail, is two feet, five inches. This dog possesses great agility, and is full of courage; when running, he carries his head up, and his tail raised or extended horizontally; and he is very voracious, seizing upon every sort of animal food that comes in his way.

The natural habits of the species even in dogs, are not entirely overcome by domestication. The well-fed dog, however he may know from experience that he shall receive a regular meal from the hand of his master, often hides his food; although, perhaps, he never returns to his concealed stores; this is an hereditary habit, transmitted to him from a distant period when his species were dependent upon chance for a supply of their necessities. The Australasian dog, who is taken from a country very imperfectly civilized, and who has perhaps lived in packs associated in the pursuit of the penguin and the kangaroo, cannot readily put on the subordination of the mastiff or the spaniel. Even among the best disciplined domestic dogs of our own country, the ancient instinct, which renders them beasts of prey, sometimes breaks out. We recollect several instances within our own knowledge, of house dogs having taken, as the farmers expressed it, to worrying sheep; they would do this slyly; and would sometimes effect the most lamentable destruction. There is no remedy short of the capital punishment of such offenders; for they can never be broken off the habit, when it has been once indulged. Bewick, in his History of Quadrupeds, relates a story of a dog, who in 1784, had been left on the coast of Northumberland by the crew of a smuggling vessel. Finding himself deserted, and without food, he began to worry sheep, and was soon the terror of the country. He would bite a hole in the right side of the poor animals, eat the fat about the kidneys, and then leave them. The farmers were so much alarmed by his depredations, that very extraordinary means were used for his destruction; they chased him with dogs as they would a fox or wolf; but when the dogs came up to their guilty fellow, he invariably lay down in a supplicating posture, and thus they could never be induced to harm him. He was one day pursued from Howick to upwards of thirty miles distance; but he returned thither, and killed sheep the same evening. He was at last shot, after a three months' career of murder, upon a rock which commanded a view of four roads; and where he constantly sat like a guilty outlaw, watching the approach of his pursuers, and ready for escape. The practice of this dog was evidently the result of an hereditary instinct, accidentally called into action by want of food.

The Dhole.—This is the wild dog of the East Indies, and resembles the dingo of New Holland in figure, being about the size of a small greyhound. He has an uncommonly keen look, the countenance being highly enlivened by a remarkably brilliant eye. His body is slender and deep-chested, is very thinly covered with a reddish-brown coat of hair, or more properly of a rich bay colour. The tail is long and thin, becoming, like the feet, ears, and muzzle, darker towards the extremities. His limbs, though light and compact, appear to be remarkably strong, and to be equally calculated for speed and for power. The dhole is said to be perfectly gentle, if unmolested, but if attacked he is extremely fierce and implacable. In hunting, the dholes run mute, except that now and then they utter a whimpering kind of note, similar to that of an ordinary dog in the moment of anxiety. The dholes run with great speed, from which their chases cannot be of long duration; and, indeed, few animals could stand before them any length of time.

The Pariah.—This is the common village dog of India. He is slender in his make, with a small face, short pricked ears, the tail thin and much curled; is deep-chested and small-bellied, with exceedingly light limbs, the hair on the neck rather long and stiff; and his general colour is of a reddish brown, something of the colour of terra sienna. The pariahs are very fleet and savage. Some of them will take a good-sized wild hog by the ear, and hold him fast; but as in these conflicts many of them receive desperate wounds, they become more cautious and cunning, and confine their attacks to the hind-quarters of their antagonist.

The Ekia, or African dog.—The dogs of Africa seem to resemble those of Asia, and in all probability are originally sprung from the same stock. Artus tells us, that the dogs of the Gold Coast are of various colours, as white, black, red, brown, and yellow. The negroes eat them; so that in many places they are driven to market like sheep and hogs, and sold. By the natives they are called Ekia, or Cabra Matto (from the Portuguese), which signifies wild goats. They are so esteemed, that those who aspire to nobility are obliged to present them to the king. The European dogs are much valued there, on account of their barking; the negroes think that they speak. Such is the estimation in which the flesh of the dog is held by those savages, that they will give a sheep in exchange for one at any time; and if he is of a large size, they will give something to boot, in order to put him into their barking, or dog school, out of which they sell their puppies at a very high price. They prefer dogs' flesh to that of cattle. The wild dogs of Loango, or Lower Guinea, go out to hunt in large packs; and when they meet with a lion, tiger, or elephant in their course, they set upon him with such fury, that they usually overcome him. In these encounters they often lose a number of their pack. They do little or no damage to the inhabitants. They are red-haired, have small slender bodies, and their tails turn up upon their backs like those of the greyhound. The wild dogs at the Cape of Good Hope also range in large packs, and clear the whole country where they abound, of all the wild beasts, and even the domestic flocks belonging to the several districts. What they kill they carry to a place of rendezvous, but allow the Europeans and Hottentots, who follow them, to take what they think proper without resistance. The Hottentots eat the flesh they thus obtain, and the whites salt it for their slaves.

The South American dog.—This is a half-reclaimed variety of the dog, and is about the size of a spaniel or springer. His head, with the short pricked ears, is much like that of the dingo and the dhole, but the hair is longer, particularly on the tail. The back is of a brown-gray tinge, with ochre-coloured spots on the flanks and legs; the ground colour is gray, and lighter on the belly. The South American dog is very like the wolf in appearance, and is probably the dog which was noticed by the early voyagers to that country, who assert that the Indians tamed wolves. These dogs, in a wild state, are very numerous, and live in earths in the same manner as foxes. When their whelps are taken young, they are easily tamed, and soon attach themselves to man, and never desert him afterwards to rejoin the society of wild dogs. They are said to be very swift in the chase.

The Alco.—This variety, as described by Buffon, has an extremely small head and pendulous ears, curved back, and short tail. The alco is reported to be the original or indigenous dog found by the Spaniards in South America at the time of the discovery of that vast continent. Columbus was in many respects a good and great man; and yet, when he found, upon his return from Spain to Hispaniola, that the unfortunate people were in revolt against the oppressions of his soldiers, he was determined to put them to death in the most cruel manner, for that resistance to tyranny which was their natural right and duty. He went forth against the wretched people with his foot-soldiers and cavalry. The historian, Herrera, adds, "part of the force employed by Columbus, on this occasion, consisted of twenty bloodhounds, which made great havoc amongst the naked Indians." Only one of the writers of these times speaks of such cruelties as they deserve; and he was an extraordinary enthusiast, who spent his whole life in the endeavour to mitigate the fury of the conquerors. The name of this benevolent man was Bartholomew Las Casas. Relating the events which took place in the island of Cuba, he says, "In three or four months I saw more than seven thousand children die of hunger, whose fathers and mothers had been dragged away to work in the mines. I was witness at the same time of other cruelties not less horrible. It was resolved to march against the Indians who had fled to the mountains. They were chased like wild beasts with the assistance of bloodhounds, who had been trained to the thirst for human blood. Other means were employed for their destruction, so that before I had left the island, a little time after, it had become almost entirely a desert." And a desert it has partly remained to this day. The coast, which was most populous at the time when Columbus first touched there, is that which extends westward of the city of Trinidad, along the gulf of Xagua. Mr. Irving, the historian of Columbus, thus describes its present state: "All is now silent and deserted; civilization, which has covered some parts of Cuba with glittering cities, has rendered this a solitude. The whole race of Indians has long since passed away, pining and perishing beneath the domination of the strangers whom they welcomed so joyfully to their shores." We shudder; and yet this is only a page out of the great book of human history, which records but little else than evils committed upon mankind, under the hateful names of conquest and glory.

The North American dog.—This is a variety possessed by the North American Indians. It is a half-reclaimed dog, and differs very materially from that of South America, being more like those found in the Falkland Islands, which are said to have been landed there by the Spaniards. In the shape of his head and pricked ears he bears a strong resemblance to the dingo, and is distinguished for his uncommon keenness of scent.

DOMESTICATED DOGS WHICH HUNT IN PACKS OR SINGLY, PRINCIPALLY BY THE EYE, ALTHOUGH SOMETIMES BY THE SCENT.

The Irish Greyhound.—This is one of the largest of the canine race, with an air at once beautiful, striking, and majestic. He has been known to grow to the extraordinary height of four feet, although the general standard is about three feet. The Irish greyhound is now rarely to be met with even in his native country.

The Albanian dog.—This variety has been noticed by historians, naturalists, and poets, ever since Europe assumed any consequence in the history of nations. Not contented with the ordinary laws of nature, the poets have ascribed a supernatural origin to this animal, and powers of infallibity have been attributed both to its judgment and its strength. Diana is said to have presented Procris with a dog which was always sure of its prey, together with a dart which never missed the object at which it was aimed, and, besides, never failed to return to its owner. The canine genealogists of antiquity traced the origin of the celebrated dogs which were everywhere to be met with in the south-east, particularly those of Sparta and Molossus, to this gift of Diana. In Albania, and adjacent states of Europe, this excellent race continues, and they still agree in point of quality with those of ancient times. The Albanian dog is about the size of a mastiff; his hair is of a very fine consistence, very thickly set, resembling fur, and of a long and silky texture, generally of different shades of brown; his tail is long and bushy, which he carries somewhat in the manner of the Newfoundland dog; his legs are strong, shorter, and with more bone than those of the greyhound, on which account he seems formed for strength rather than for excessive speed. The head and jaws are elongated, with the nose pointed, something like that of the Greenland dog, but rather longer. This dog in former times was used in hunting the wild boar and the wolf, as well as in fighting: and was also reared in pastoral districts to protect their folds from wolves and thieves.

The French Matin.—This variety has the head elongated, and the forehead flat; the ears are erect like those of the greyhound, and slightly pendulous towards the tips; the colour of the hair is generally of a yellowish fawn, with blackish, slate-coloured, oblique, and parallel indistinct rays all over the body. He is about three feet long, and two feet high, and is a very muscular and active dog; possesses great courage, and displays much ferocity in attacking wolves and wild boars, in the hunting of which he is frequently employed. In the chase he moreover evinces great eagerness and perseverance. The principal use of the matin in France is the tending of flocks, in which service he has all the qualities of the shepherd's dog of this country; he is also employed as a house-dog, and is extremely assiduous and watchful, protecting to the last extremity his master's property. He is held in high estimation in France.

The Great Danish Dog.—Buffon was of opinion that this variety is only the French matin transported into a northern latitude. The colour of this dog is generally white, marked all over his body with numerous black spots and patches, in general larger than those of the Dalmatian. His ears are for the most part white, while those of the Dalmatian are usually black. The Great Danish Dog is a fine sprightly animal, but is of little use either for sporting or watching. He is chiefly used as an attendant on carriages, to which he forms an elegant appendage.

The Scottish Highland Greyhound, or Wolf Dog.—This is a large and powerful dog, nearly equal in size to the Irish greyhound. His general aspect is commanding and fierce; his head is long, and muzzle rather sharp; his ears pendulous but not long; his eyes large, keen, and penetrating, half-concealed among the long, stiff, bristly hair with which his face is covered; his body is very strong and muscular, deep-chested, tapering towards the loins, and his back slightly arched; his hind-quarters are furnished with large prominent muscles, and his legs are long, strong-boned, and straight,—a combination of qualities which gives him that speed and long duration in the chase for which he is so eminently distinguished. His hair is shaggy and wiry, of a reddish sand colour, mixed with white; his tail is rough, which he carries somewhat in the manner of a stag-hound, but not quite so erect. This is the dog formerly used by the Highland chieftains of Scotland in their grand hunting parties, and is in all probability the same noble dog used in the time of Ossian. The Scottish Highland greyhound will either hunt in packs or singly. A remarkably fine and large dog of this description was long in the possession of Sir Walter Scott, Bart., and was a most appropriate guardian for his unique and magnificent seat at Abbotsford. This splendid dog was presented to Sir Walter as a mark of the highest respect and esteem by the late chieftain, Macdonell of Glengarry. He preserved this race of dogs with much care; and, in order to prevent the degeneracy which arises from consanguinity, he was in the practice of crossing the breed with the blood-hound from Cuba, and also with the shepherd's dog of the Pyrenees, which is distinguished for its size, beauty, and docility. Sir Walter Scott's Maida was the offspring of a sire of the latter species, and a dam of the Scottish Highland race, and certainly was one of the finest dogs of the kind that was ever seen in this country, not only on account of his symmetry of form and dignified aspect, but also from his extraordinary size and strength.

This fine specimen of the dog probably brought on himself premature old age by the excessive fatigue and exercise to which his natural ardour inclined him; for he had the greatest pleasure in accompanying the common greyhounds; and although from his great size and strength he was not at all adapted for coursing, yet he not unfrequently turned and even ran down hares. Maida lies buried at the gate of Abbotsford, which he long protected; a grave-stone is placed over him, with the figure of a dog cut on it by Mr. John Smith of Melrose, and bears the following inscription:

> Maida, tu marmorea dormis sub imagine Maida
> Ad januam domini. Sit tibi terra levis!

The Russian Greyhound.—This is a large and powerful dog, nearly equal in strength to the Irish greyhound, which he also resembles in shape; his hair is long and bushy, and his tail forms a spiral curl, but which in the chase stands nearly straight behind him. The colour of the Russian greyhound is generally of a dark umber brown, but sometimes black: his coat is rough and shaggy. When the Russian greyhound loses sight of the hare he runs by the scent. Indeed, when parties go out a-coursing, this dog even endeavours to find game.

DOMESTICATED DOGS WHICH HUNT SINGLY AND ALWAYS BY THE EYE.

The Gazehound.—This dog was similar in figure and habits to the greyhound; and, as its name implies, hunted in the same manner as the latter, principally by the eye, and, in early times, was used for coursing both foxes and hares in the north of England. Bewick mentions also, that it was employed in hunting the stag. It is said that a gazehound could select from a herd of deer the fattest, and pursue it with such unerring keenness, that although the stag rejoined the herd, he never failed to keep it in view, nor would he give up the pursuit till he had taken and killed his prey.

It would appear that the English gave this dog the name of *Agasæus*, a gazehound, from the steady and infallible quality of its visual organs; and, from all accounts, in coursing with this dog it was almost invariably the practice to follow on horseback.

It is remarkable that, although this dog is [illegible] tioned by many authors, there is no representation of him by which we can judge of his form with accuracy.

The Greyhound is supposed to have originated in the Irish greyhound, but to have been rendered thinner and more delicate by the influence of climate and culture, and brought to his present state of high perfection by the persevering attention of zealous breeders. The strong similitude of these dogs in shape and general character holds out good grounds for the adoption of such an idea;—the smallness of his muzzle, length of neck, depth of chest, and the light airiness of his whole figure, and especially the length and elegance of his legs. A curious book, published in 1496, by Wynken de Worde, gives the following qualities as the best in the choice of a greyhound:—

"Headed lyke a snake,
Neckyed lyke a drake,
Footyed lyke a catte,
Taylled lyke a ratte,
Syded lyke a teme,
And chyned lyke a beme."

The greyhound is less susceptible of education than most others, seemingly from his more limited intelligence. He is, however, possessed of strong sentiments, and is more alive to caresses than any other dog; his emotions are very strong on such occasions, if we may judge from the violent and irregular movements of the heart.

The greyhound in ancient times was considered as a very valuable present, and more especially by ladies, who looked upon it as a compliment of the most gratifying nature. So far back as the time of King Canute, it was enacted by the forest-laws, that no person under the degree of a gentleman should presume to keep a greyhound; that animal being regarded by the sovereign as a companion peculiarly suited to elevated rank. In the reign of Charles the First, greyhounds were held in high estimation. The Isle of Dogs, now converted into the reservoir for the West India shipping, derived its name from being the receptacle of the greyhounds and spaniels of Edward the Third; and this spot was selected from its contiguity to Waltham, and the other royal forests.

We owe much of the superiority of our present breed of greyhounds to the perseverance and judgment of the late Earl of Orford, of Houghton in Norfolk; and it is supposed he obtained the great depth of chest and strength of his breed from crossing with the bull-dog. At his death his greyhounds were sold by auction, and some of his best were purchased by Colonel Thornton; from one of them was produced the best greyhound that ever appeared, Snowball; although indeed he was nearly equalled by his brothers, Major and Sylvia, who were all of the same litter. They were never beaten, and may be considered as examples of the most perfect greyhound. The shape, make, elegant structure, and other characteristics of high blood, were equally distinguishable in all the three; the colour of Snowball was a jet black, and, when in good running condition, was as fine in the skin as black satin. Major and Sylvia were singularly but beautifully brindled.

The Scotch Greyhound.—This dog, in point of form, is similar in all respects to the common greyhound, differing only in its being of a larger size, and in the hair being wiry, in place of that beautiful sleekness which distinguishes the coat of the other. Their colour for the most part is of a reddish-brown or sandy hue, although they are sometimes to be met with quite black. They are said to be the only dogs which are capable of catching the hares which inhabit mountain ranges,—the common greyhound wanting strength for such a laborious chase.

The Italian Greyhound is about half the size of the common greyhound, and is perfectly similar in form. He is too small to have sufficient speed for taking a hare, and is in consequence never employed in the chase,—his principal use being an attendant on the great. In Italy, men of rank are frequently seen either walking or riding followed by several of these dogs.

The Turkish Greyhound.—This is a diminutive variety of the greyhound, probably reduced to its small size from the influence of climate. It is little more than half the bulk of the Italian greyhound; and like the same animal, both in this country and in Italy, is an attendant on people of rank, and usually kept as a pet. The Turkish greyhound is quite naked, with only a few scattered hairs on its tail. The colour of the skin is leaden or black, and has all the appearance of leather. His ears are long and erect.

This dog is said to possess great attachment to his master. We have heard of one which belonged to a Pacha who was beheaded, that laid itself down on the body of his murdered master and expired.

DIVISION II.

HEAD LESS ELONGATED THAN FORMER DIVISION.

PASTORAL DOGS, OR SUCH AS ARE EMPLOYED IN DOMESTIC PURPOSES.

The Shepherd's Dog.—This dog is distinguished by his upright ears and sharp muzzle, with a great villosity of the under part of the tail, as well as on the back of the forelegs. The body is rather long, covered with a thick woolly-like hair, and the legs are rather short. There is a singularity in the feet of the shepherd's dog, all of them having one, and some of them two superfluous toes; which appear destitute of muscles, and hang dangling at the hind part of the leg more like an unnatural excrescence than a necessary part of the animal. But, as "Nature has made nothing in vain," these must certainly be destined for some useful purpose with which we are not yet acquainted. These dew-claws are likewise sometimes found in the spaniel, pointer, and cur dog; in the two former they are generally cut off at an early stage, as they are an impediment in covers, and frequently get torn, thereby creating sores, and sometimes rendering the dog unfit for use. This useful and intelligent animal is one of the most placid, obedient, serene, and grateful members of the canine race. He is ever alive to the slightest indication of his master's wishes, prompt and gratified to execute them; and he seems to enjoy the greatest delight when employed in any kind of useful service. Formed by nature with an instinctive propensity to industry, he is never more pleased than in exerting his talents for the benefit of man, and in giving constant proofs of his inviolable attachment.

The native calmness, patience, and devoted faithfulness of the shepherd's dog, render him insensible to all attractions beyond the arduous duties connected with the flock under his care. When once properly trained, he not only becomes perfectly acquainted with the extent of his beat, but also with every individual in the flock; he will most correctly select his own, and drive off such as encroach on his limits. This appears the more extraordinary, when we consider the vast extent of mountain country and the numerous flocks committed to the charge of a single shepherd, a duty which he could not possibly perform but for the invaluable services of this sagacious animal. A word or signal from him will direct the dog so as to conduct the flock to any point required, and that signal he will obey with energy and unerring certainty. The labour of a shepherd, with the assistance of a dog, is comparatively an easy task; but without one we can hardly suppose an occupation more arduous. Indeed, without the aid of this animal, it would be next to impossible to collect flocks in those extensive and precipitous tracts of mountain-land where the sheep delight to graze, and which in many places are quite inaccessible to man.

The shepherd's dog, from being inured to all weathers, is naturally hardy; and, accustomed to fatigue and hunger, he is the least voracious of the species, and can subsist upon a scanty allowance. If a shepherd is travelling with his flock to a distance, his dog will only repose close to his feet; and should he wish to leave them for the purpose of taking refreshment, he has only to imitate his intention to his dog, and, in his absence, he will guard the sheep with as much care, and keep them within due bounds, as well as he himself could have done. Although left alone for hours, a well-trained dog always keeps the flock within the limits of a made road, even although there are no fences; he watches every avenue and cross-path that leads from it, where he posts himself until they are all past, threatening every one who attempts to move that way; and should any of them escape, he pursues them, and will force them back to their companions without injuring them. The breed of this dog is preserved with the greatest attention to purity in the north of England, and in the Highlands of Scotland, where his services are invaluable. The shepherd's dog of this country, with all his good qualities, is still greatly inferior in point of size and strength to those of the Alps, and of that extensive range of mountains which divide France from Spain, as well as to the variety which is found in the neighbourhood of Caucasus. In this country there are two kinds of this dog, — that used by shepherds, which is of a small size, and the breed used by drovers and butchers.

The Cur Dog is a variety sprung from the shepherd's dog, and is extremely useful to the farmer in driving cattle, which he does with great accuracy. He differs from the shepherd's dog in being almost entirely smooth. He is considerably longer in the legs in proportion to the size of his body, which is a good deal larger than that of the shepherd's dog, and is stronger in the make, with half-pricked ears, and a tail which has a natural tendency to be short. In the north of England and southern counties of Scotland, great attention is paid to the breeding of this dog, as he is found to be a trusty and useful servant; and great care is also devoted to breaking him in for that purpose. These dogs bite very keenly, and always make their attack at the heels of cattle. The cur dog is very sagacious, and soon acquires a knowledge of his master's fields, which he watches with great vigilance, and is very attentive to the movements of the cattle which are in them. He goes his rounds regularly, and if strange cattle appear amongst the herd, he flies at them with great ferocity, and forces them instantly to leave the invaded pasture. The colour of the cur dog is generally black and white, although it is sometimes found all black.

The Pomeranian Dog is somewhat similar to the Lapland, Siberian, and Iceland dogs. It is much shorter in the legs, and its coat much more bushy; so much so, that the shape of its body is not unlike a muff. Its muzzle is acute and long, and is undoubtedly nearly allied to the shepherd's dog.

The Siberian Dog appears to be nearly related to the Pomeranian, being very like it in general appearance, except that it is covered with longish hairs all over the legs, even on the head and paws.

The Siberian dog is not uncommon in many of the countries about the arctic circle, and is used in Kamtschatka for drawing sledges over the frozen snow, these sledges generally carrying only a single person, who sits sideways. The number of dogs usually employed is five; four of which are yoked, two and two, while the other acts as leader. The reins are fastened, not to the head, but to the collar, and the driver has, therefore, to depend principally on their obedience to his voice. Great care and attention are consequently necessary in training the leader, which, if he is steady and docile, becomes very valuable, the sum of forty roubles (or ten pounds) being no uncommon price for one of them.

These animals have been known to perform, in three days and a half, a run of nearly 270 English miles. And scarcely are horses more useful to Europeans, than these dogs are to the inhabitants of the frozen and cheerless regions of the north. During the most severe storm, when their master cannot see the path, nor even keep his eyes open, they very seldom miss their way.

The Greenland Dog is of a large size, with strong bones, and is covered with thick-set white hair, which stands nearly erect like bristles, with a shorter kind, much like wool, at the roots. This animal is of great service to the natives of those inhospitable regions; for the Greenlanders not only feed on dogs, but also make dresses of their skins, and use them for drawing sledges on the ice and incrusted snow. The Greenland dog may be said rather to howl than bark; indeed this seems to be the case with all wild dogs, and also with those which are bred towards the poles, whether north or south. There are some in the northern regions do not bark at all.

The Iceland Dog.—This variety of the dog bears a strong resemblance to that of Greenland, differing, however, in the hair and woolly fur not being quite so long. The Iceland dog is frequently of great use to the natives, especially while travelling in winter through the snowy, trackless, and extensive deserts with which that country abounds, as he is often their only companion in these excursions.

The Esquimaux Dog very much resembles, in shape and colour, the Pomeranian breed, which is now nearly extinct in Great Britain. He is, however, considerably larger, but not quite so large as the Newfoundland. The shape of the head is much like that of a wolf, with short erect pricked ears and large fierce eyes; he has immense bone in the fore-legs, with great strength in his loins, two essential qualities for the purposes of draught, to which this dog is much applied in his native country.

The Newfoundland Dog.—In a state of purity, and uncontaminated by a mixture with any inferior race, this is certainly the noblest of the canine tribe. His great size and strength, and his majestic look, convey to the mind a sort of awe, if not fear, but which is quickly dispelled when we examine the placid serenity and the mild and expressive intelligence of his countenance, showing at once that ferocity is no part of his disposition. The full-sized Newfoundland dog, from the nose to the end of the tail, measures about six feet and a half, the length of the tail being two feet; from the one fore-foot to the other, over the shoulders, five feet eight inches; girth behind the shoulders, three feet four inches; round the head, across the ears, two feet; round the upper part of the fore-leg, ten inches; length of the head, fourteen inches; and his feet are webbed, by which means he can swim with great ease. He is covered with long shaggy hair, has feathered legs, and an extremely villous tail, which is curvilinear. This dog is but of recent introduction into this country from the island whose name he bears, and may be considered as a distinct race.

The Newfoundland dog is docile to a very great degree, and nothing can exceed his affection. Naturally athletic and active, he is ever eager to be employed, and seems delighted to perform any little office required of him. Nature has given him a great share of emulation, and hence to be surpassed or overcome is to him the occasion of great pain. Active on every emergency, he is the friend of all.

and is naturally without the least disposition to quarrel with other animals; he seldom or never offers offence, but will not receive an insult or injury with impunity. Such is the capacity of his understanding, that he can be taught almost any thing that man can inculcate, and of which his own strength and frame are capable. His sagacity can only be exceeded by his energies, and he perseveres with unabated ardour in whatever shape he is employed, and while he has a hope of success he will never slacken in his efforts to attain it. The amazing pliability of his temper peculiarly fits him for the use of man, and he never shrinks from any service which may be required of him, but undertakes it with an ardour proportionate to the difficulty of its execution. Taking a singular pride in being employed, he will carry a stick, a basket, or bundle, for miles in his mouth, and to deprive him of any of these is more than any stranger could accomplish with safety. Sagacity and a peculiarly faithful attachment to the human species are characteristics inseparable from this dog, and hence he is ever on the alert to ward off from his master every impending danger, and to free him from every peril to which he may be exposed. He is endowed with an astonishing degree of courage, whether to resent an insult or to defend his friends, even at the risk of his own life.

Habitually inclined to industrious employment, such dogs are as useful to the settlers of the coast from which they are brought as our ponies and galloways are to us. It is easy to accustom them to daily labour. From three to five of them are harnessed to a sledge, or other vehicle, containing a load of wood or lumber, amounting to twenty or thirty stones, which they steadily draw for miles with ease. This they do without the aid of a driver, when they are acquainted with the road; and having delivered their burden, they return home to their master, and receive, as a reward for their labour, their accustomed food, which generally consists of dried fish, of which they are said to be extremely fond. The qualifications of this dog are extensive indeed; as a keeper or defender of the house he is far more intelligent, more powerful, and more to be depended upon than the mastiff, and has of late years been much substituted for him in England; indeed he may with great propriety entirely supersede that breed. As a watch-dog, and for his services upon navigable rivers, none can come in competition with him; and various sportsmen have introduced him into the field as a pointer with great success, his kind disposition and sagacity rendering his training an easy task.

The Russian Dog.—This dog is of a large size, being considerably superior in point of strength to the Newfoundland dog. He was originally produced by a cross between the Newfoundland and the Siberian, and has now assumed the characteristics of a distinct race. In Russia this animal is employed for watching property, which he defends with all the assiduity of a mastiff or Newfoundland dog. He is sometimes also used in hunting the wolf and wild boar, for which he is admirably adapted, from his great strength, and from possessing considerable swiftness. His feet are semi-webbed, and he swims with great ease, and is accordingly often used in shooting aquatic birds, which he fetches out of the water when killed.

The Great Rough Water Dog is web-footed, swims with great ease, and is used in hunting ducks and other aquatic birds. From its aptness to fetch and carry, it is frequently kept on board of ships, for the purpose of recovering any thing that has fallen overboard; and is likewise useful in picking up birds that are shot, and drop into the sea. Its dexterity in diving is truly astonishing, and such is the sagacity of many of them, that they will actually fetch up a particular stone thrown to the bottom of a river or pond.

Large Water-Spaniel.—The Large Water-Spaniel is about the size of an ordinary setter, but much stronger in the bone and shorter in the legs. His head is long, and his muzzle moderately acute, his face is quite smooth, as well as the front of all his legs; his ears are long, which, together with his whole body, are covered with deep hair, consisting of firm, small, and distinctly crisped curls, not unlike those of a wig—his tail is rather short, and clothed with curled hair. His hair is very differently curled from the great water-dog and poodle, as that of the two latter consists of long and pendulous curls. His general colour is a dark liver-brown, with white legs, neck, and belly; and is sometimes, though rarely, to be met with all black, or with a black body and white neck and legs. His smell is extremely acute, and he has in some instances been taught to set; but this is rather a difficult task, from his naturally lively disposition. He takes the water with great eagerness, on which account he is a valuable dog in shooting wild fowl; he watches with much keenness and anxiety the motions of his master, and as soon as a bird is killed, he instantly plunges into the water, fetches it out, and lays it at the feet of his master.

The Small Water-Spaniel, or Poodle.—This variety is presumed to be the offspring of the large water-dog and the small cocker: it has all the appearance of the former, not only in shape, but also in the thick curled silky hairs. It is a most lively active dog, with an acute sense of smell, and is very susceptible of instruction of almost any kind. Its general colour is white, although individuals are sometimes found with black patches over various parts of their bodies. The Poodle is very fond of diving, and can find at the bottom of a river or pond any particular stone thrown in by his master.

FOWLERS, OR DOGS WHOSE NATURAL INCLINATION IS TO CHASE AND POINT BIRDS, AND HUNT SINGLY BY THE SCENT.

The Springer, or Springing Spaniel.—There are two different dogs which usually pass under this denomination; one being considerably larger than the other, and known by the name of the Springing Spaniel, as applicable to every kind of game in any country. The Springer is supposed to have originated in Great Britain, although it is now widely diffused over every quarter of the globe. He is much used and eagerly sought after in the wild sports of the East. The true English-bred Springing Spaniel differs but little in figure from the setter, except in size; their chief difference consists in the former having a larger head than the latter in proportion to the bulk of his body; they vary also in a small degree in point of colour, from red, yellow, or liver-colour, and white, which seems to be the invariable standard of the breed. They are nearly two-fifths less in height and strength than the setter, their form being more delicate, their ears longer, very soft and pliable, covered with a coat of long waving and silky hair; the nose is red or black, the latter being the surest mark of high breeding; the tail is bushy and pendulous, and is always in motion when employed in pursuit of game. Differently from other dogs used in shooting, both the springer and cocker give tongue the moment they either smell or see game; and this gives intimation to the sportsmen, who generally station themselves on the skirts of the wood or covert to which woodcocks, snipes, and pheasants are known to fly when started. In his general qualification, the cocker differs but little from the springer, except that he is decidedly more active; he appears also to have a more acute sense of smelling, and pursues game with an enthusiasm amounting to ecstacy. From his lively temperament, he does not tire so soon as the springer, however long the labour of the day may be.

Of the same kind is the dog known under the appellation of *King Charles's dog*, the favourite and constant companion of that monarch, who was generally attended by several of them. It is still preserved as an idle, but innocent, animal. Its long ears, curled hair, and web feet, evidently point out its alliance with the more useful and active kind last mentioned.

Similar to this, but smaller, is the *Pyrame Dog.* It is generally black, with reddish legs; and above each eye is a spot of the same colour.

Still farther removed, we have the *Shock Dog;* a diminutive creature, almost hid in the great quantity of its hair, which covers it from head to foot.

Another variety is the *Lion Dog;* so called from the shaggy hair which covers the head and all the fore part of the body; whilst the hinder part is quite smooth, saving a tuft of hair at the end of the tail. This species is become extremely rare.

The Alpine Spaniel.—These wonderful dogs have been usually called mastiffs, probably on account of their great strength; but they strictly belong to the sub-division of spaniels, among which are found the shepherd's dog, the Esquimaux dog, and other varieties most distinguished for intelligence and fidelity. The convent of the Great St. Bernard is situated near the top of the mountain known by that name, near one of the most dangerous passages of the Alps, between Switzerland and Savoy. In these regions the traveller is often overtaken by the most severe weather, even after days of cloudless beauty, when the glaciers glitter in the sunshine, and the pink flowers of the rhododendron appear as if they were never to be sullied by the tempest. But a storm suddenly comes on; the roads are rendered impassable by drifts of snow; the avalanches, which are huge loosened masses of snow or ice, are swept into the valleys, carrying trees and crags of rock before them. The hospitable monks, though their revenue is scanty, open their doors to every stranger that presents himself. To be cold, to be weary, to be benighted, constitute the title to their comfortable shelter, their cheering meal, and their agreeable converse. But their attention to the distressed does not end here. They devote themselves to the dangerous task of searching for those unhappy persons who may have been overtaken by the sudden storm, and would perish but for their charitable succour. Most remarkably are they assisted in these truly Christian offices. They have a breed of noble dogs in their establishment, whose extraordinary sagacity often enables them to rescue the traveller from destruction. Benumbed with cold, weary in the search for a lost track, his senses yielding to the stupifying influence of frost which betrays the exhausted sufferer into a deep sleep, the unhappy man sinks upon the ground, and the snow-drift covers him from human sight. It is then that the keen scent and the exquisite docility of these admirable dogs are called into action. Though the perishing man lie ten or even twenty feet beneath the snow, the delicacy of smell with which they can trace him offers a chance of escape. They scratch away the snow with their feet; they set up a continued hoarse and solemn bark, which brings the monks and labourers of the convent to their assistance. To provide for the chance that the dogs, without human help, may succeed in discovering the unfortunate traveller, one of them has a flask of spirits round his neck, to which the fainting man may apply for support; and another has a cloak to cover him. These wonderful exertions are often successful; and even where they fail of restoring him who has perished, the dogs discover the body so that it may be secured for the recognition of friends; and such is the effect of the temperature, that the dead features generally preserve their firmness for the space of two years. One of these noble creatures was decorated with a medal in commemoration of his having saved the lives of twenty-two persons, who but for his sagacity must have perished. Many travellers who have crossed the passage of St. Bernard, since the peace, have seen this dog, and have heard around the blazing fire of the monks the story of his extraordinary career. He died about the year 1816, in an attempt to convey a poor traveller to his anxious family. The Piedmontese courier arrived at St. Bernard in a very stormy season, labouring to make his way to the little village of St. Pierre, in the valley beneath the mountain, where his wife and children dwelt. It was in vain that the monks attempted to check his resolution to reach his family. They at last gave him two guides, each of whom was accompanied by a dog, of which one was the remarkable creature whose services had been so valuable to mankind. Descending from the convent, they were in an instant overwhelmed by two avalanches; and the same common destruction awaited the family of the poor courier, who were toiling up the mountain in the hope to obtain some news of their expected friend. They all perished. A story is told of one of these dogs, who, having found a child unhurt whose mother had been destroyed by an avalanche, induced the poor boy to mount his back, and thus carried him to the gate of the convent. The subject is represented in a French print.

The Old English Setter. — This breed was originally produced between the Spanish pointer and the large water-spaniel, and was famous on account of his steadiness and exquisite sense of smelling; the hair over the whole body was much more curled than that of the present breed, which has been considerably lightened by the additional cross of the springer; he was also much more steady than the improved variety, but then he had not the same speed to recommend him. Fine dogs of this kind were also produced by a cross with the stag and blood-hounds. They united great strength, considerable swiftness, and were used for the chase in some few instances.

The English Setter is a breed produced between the Spanish pointer, the English water-spaniel and springer, which, by careful cultivation, has attained a high degree of perfection as a sporting dog. He has an elegant figure, and a very pleasing diversity of colour; added to this, his skin is covered with beautifully curled hair, very villous on the lower margin of the tail; being altogether an extremely handsome dog.

Formerly the setter was used for the purpose of taking partridges with the draw-net, and was generally taught to squat down when the game was within a proper distance,—hence the name setter. They are now, however, trained to point in the same manner as the spaniel.

The Comforter.—This beautiful little dog seems to be a cross betwixt the Maltese and the small spaniel. His colour is generally white, with black or brown patches. This is the smallest of any of the distinct races of dogs, frequently not above a foot from the tip of the nose to the point of the tail. This elegant little animal is used as a lapdog, or as an attendant on the toilet or in the drawing-room. He is most affectionate to all the members of the family in which he resides, but is very snappish to strangers, whose familiarity he will seldom permit.

The Maltese Dog.—This is a diminutive variety of the smaller spaniel, and is supposed to have sprung from the intercourse of that dog with the smaller water-dog. The hair all over the body is extremely long and silky, and usually of a silvery white. He is a beautiful little animal, and is much esteemed by the fair sex in Malta and other islands in the Mediterranean.

The Spanish Pointer is of a foreign origin, as his name implies; but it is now naturalized in this country, which has long been famous for dogs of this kind; the greatest attention being paid to preserve the breed in its utmost purity.

This dog is remarkable for the aptness and facility with which it receives instruction. It may be said to be almost self-taught; whilst the English pointer requires the greatest care and attention in breaking and training to the sport. The Spanish pointer, however, is not so durable and hardy, nor so able to undergo the fatigues of an extensive range.

The English Pointer.—This dog is sprung from the Spanish pointer, but is of a much lighter form, and much more rapid in his movements. He was obtained originally by a cross of the latter and the fox-hound, and has since been re-crossed with the harrier. The English pointer is of a great variety of sizes, being in this particular bred according to the taste of the sportsman. This dog possesses a beautiful symmetry of frame. His docility and pliability of temper, too, are truly astonishing, and he enjoys, at the same time, the sense of smelling in an exquisite degree.

The Small Pointer.—A small variety of the pointer is common in the south of Germany. His length, from the point of the nose to the tip of the tail, is about two feet. He is an exquisite miniature of the English pointer, being in all respects similar to him.

The Russian Pointer.—This variety seems only to be a descendant of the Spanish pointer, which he strongly resembles in shape, with rough wiry hair all over his body. There is one peculiarity about him, which is, that his nose is so deeply cleft that it appears to be split in two, on which account he is termed in Russia the double-nosed pointer. His scent is said to be superior to that of the smooth dogs.

The Dalmatian, or coach-dog, has been called by some the Danish dog, and the harrier of Bengal by Buffon; but his natural country is Dalmatia, a mountainous district of European Turkey. In Great Britain this dog has become very common, and is generally an attendant on gentleman's carriages.

HOUNDS WHICH HUNT IN PACKS BY THE SCENT.

The Scotch Terrier.—It is now impossible to trace the origin of the terrier, but from the many characteristics peculiar to itself, we would almost be induced to consider it a primitive race. Certain it is, that this dog has been for many ages assiduously cultivated, and trained to the particular sports to which nature seems to have so well adapted him. To the fox, hare, rabbit, badger, polecat, weasel, rat, mouse, and all other kinds of vermin, he is a most implacable enemy. He has also a strong natural antipathy to the domestic cat. The name terrier seems to be derived from the avidity with which he takes the earth in pursuit of all those animals which burrow. There are two kinds of terriers, the rough-haired Scotch and the smooth English. The Scotch terrier is certainly the purest in point of breed, and the English seems to have been produced by a cross from him. The Scotch terrier is generally low in stature, seldom more than twelve or fourteen inches in height, with a strong muscular body, and short and stout legs; his ears are small and half-pricked; his head is rather large in proportion to the size of his body, and the muzzle considerably pointed; his scent is extremely acute, so that he can trace the footsteps of all other animals with certainty; he is generally of a sand-colour or black. Dogs of these colours are certainly the most hardy, and more to be depended upon. When white or pied, it is a sure mark of the impurity of the breed. The hair of the terrier is long, matted, and hard, over almost every part of his body. His bite is extremely keen. There are three distinct varieties of the Scotch terrier, namely, the one above described, another about the same size as the former, but with the hair much longer, and somewhat flowing; which gives his legs the appearance of being very short. This is the prevailing breed of the western islands of Scotland. The third variety is much larger than the former two, being generally from fifteen to eighteen inches in height, with the hair very hard and wiry, and much shorter than that of the others. It is from this breed that the best bull-terriers have been produced. The terrier, amongst the higher order of sportsmen, is preserved in its greatest purity, and with the most assiduous attention; and it seems of the utmost importance not to increase its size, which would render him unsuitable for the purposes in which he is employed, that of entering the earth to drive out other animals from their burrows, for which his make, strength, and invincible ardour, peculiarly fit him. On this account he is the universal attendant upon a pack of fox-hounds, and though *last* in the pursuit, he is not the *least* in value.

The English Terrier.—This is a handsome sprightly dog, and generally black on the back, sides, upper part of the head, neck, and tail; the belly and the throat are of a very bright reddish brown, with a spot of the same colour over each eye. The hair is short and somewhat glossy; the tail rather truncated, and carried slightly upwards; the ears are small, somewhat erect, and reflected at the tips; the head is little in proportion to the size of the body, and the snout is moderately elongated. This dog, though but small, is very resolute, and is a determined enemy to all kinds of game and vermin, in the pursuit and destruction of which he evinces an extraordinary and untaught alacrity. Some of the larger English terriers will even draw a badger from his hole. He varies considerably in size and strength, and is to be met with from ten to eighteen inches in height.

The South American Terrier.—This handsome little animal is not much larger than the comforter, or the Maltese dog: he is very elegant in his make, with a small handsome head, and short pendulous ears. In one respect he differs remarkably from other dogs, his feet being shaped somewhat like a rabbit's, and covered with a thick-set fur like theirs; and the nails, in place of being wedge-shaped like those of other dogs, are curved like those of a cat. His tail is short, covered with extremely long silky hairs. His hair is pale sand colour, and very long over his whole body and legs; down his forehead, almost to the tip of the nose, is a ridge of very long hairs, and which is also the case on his cheeks and jaws. His bark is peculiarly shrill and acute. They are kept for killing snakes in their native country.

The Old English Hound or Talbot.—The old English hound is the original breed of this island, and was used by the ancient Britons in the chase of the larger kinds of game with which this island abounded.

This majestic animal is distinguished by his great size and strength: his body is long, his chest deep, and his ears long and sweeping with great gravity of expression. From the particular formation of his organs, or from the extraordinary moisture which always flows from his nose, or from some other unknown cause, he is endowed with the most exquisite sense of smelling, and can discover scent hours after other dogs have given up. Although the talbot hunts with great certainty, yet he becomes tedious from the slowness of his motions; this, however, enables him to receive more distinctly the directions of the huntsman, and he can trace with a cold scent, which he is too apt to make so by his want of speed.

This dog is accurately described by Shakspeare in the following lines:

> "My hounds are bred out of the Spartan kind
> So flewed, so sanded; and their heads are hung
> With ears that sweep away the morning dew;
> Crook-knee'd and dew-lapp'd like Thessalian bulls;
> Slow in pursuit, but matched in mouth like bells,
> Each under each."

The Blood-hound.—The blood-hound is a tall, most beautifully formed animal, and usually of a reddish or brown colour. With our ancestors the blood-hound was an animal in great request; and as he was remarkable for the fineness of his scent, he was frequently employed in recovering game that had escaped wounded from the hunter.—He would follow, with great certainty, the footsteps of a man to a considerable distance: and in barbarous and uncivilized times, when a thief or murderer had fled, this useful creature would trace him through the thickest and most secret coverts: nor would he cease his pursuit till he had taken the felon. For this reason there was a law in Scotland, that whoever denied entrance to one of these dogs in pursuit of stolen goods, should be deemed an accessary. Blood-hounds were formerly used in certain districts between England and Scotland, that were much infested by robbers and murderers; and a tax was laid on the inhabitants for keeping and maintaining a certain number of these animals. But as the arm of justice extended over every part of the country, and there are no secret recesses where villany can lie concealed, their services are no longer necessary. Some few of these dogs are kept in the northern part of the kingdom, and in the lodges of the royal forest. They are used in pursuit of the deer that have been previously wounded; and are also sometimes employed in discovering deer-stealers, whom they infallibly trace by the blood that issues from the wounds of their victims. In Scotland they are called Sleuth-hounds.

The Stag-hound.—The stag-hound is now the largest and the most powerful of all the dogs which go under the general term of hound. He is held higher in estimation than any other dog of the chase, and has a most commanding, dignified aspect, blended with every mark of intellectual mildness.

We do not know whether in early times the stag was hunted with small or large bodies of hounds; but at the present day he is usually run with large packs. There are now, however, but few dogs kept solely for the use of stag-hunting.

The Fox-hound.—The muzzle of the fox-hound is rather long, and his head small in proportion to his body; his ears long and pendulous, though not so much so as those of the blood-hound or stag-hound. His legs are very straight, his feet round and not too large, his chest deep, and breast wide, his back broad, his neck thin, his shoulders lie well back, his tail thick and bushy, and carried high when in the chase. His colour is generally white, variously patched with black in different parts of the body.

No country in Europe can boast of fox-hounds equal in swiftness, strength, and agility to those of Britain, where the utmost attention is paid to their breeding, education, and food.

The chief excellence in a pack of fox-hounds is the head they carry, taken collectively; and on this and the fineness of their noses depend their speed. Mr. Beckford says, "that hounds should go like the horses of the sun, all abreast."

The Harrier.—This dog is now almost universally used in Great Britain for hare-hunting. He was originally generated in a double cross between the small beagle, the southern hound, and the dwarf-fox.

There are, however, various harriers produced by crosses introduced in breeding, dictated by knowledge and experience, and depending on the kind of country they hunt in, and the wish and fancy of the owner of the pack; all of which are bred by introducing either a larger or smaller cross, without a great alteration in the blood. The harrier pursues the hare with great eagerness and speed, allowing her but little time to breathe or double. The keenest sportsmen often find it difficult to keep up with this dog, and with a strong hare it is rather fatiguing work. There is a great deal of melody and cheerful harmony in the voices of harriers during the chase.

The Beagle.—This is the smallest of the dogs of the chase which go under the general denomination of hound, meaning that kind which have the innate property of finding their game and pursuing it by what sportsmen call scent. Although the beagle is far inferior in point of speed to the harrier, yet his sense of smelling a hare is equally exquisite, and he pursues her with indefatigable vigilance, energy, and perseverance.

The Otter-hound.—The otter-hound is a mixed breed between the hardy southern hound and the large rough terrier. He is a bold and fierce dog, and has a full and harmonious voice.

Otter-hunting during the reign of Queen Elizabeth was a favourite amusement amongst the young gentry of Great Britain, at which period that animal was much more numerous than at the present time, being greatly reduced since population became more dense, and gamekeepers more generally used, who employ all kinds of traps and gins to destroy them.

The Bull-Terrier.—This variety, which has now assumed a fixed character, as its name implies, was produced by a cross between the bull-dog and terrier, and this variety proves to be a handsomer dog than either of its progenitors. It is a sprightly and showy animal, and even better adapted for mischievous sport than either of the above dogs. He is airy and pleasant-tempered, but possesses great fierceness when his energies are called into action. The full-sized bull-terrier is larger than either of its original parents, from which we are inclined to think he has a dash of the mastiff in him. He has rather a large square head, short neck, deep chest, and very strong legs. He possesses great strength of jaw, and draws a badger with much ease. He is of all colours, and often white, with large black or brown patches on different parts of his body. His hair is short and stiff. This variety has risen into great reputation with gentlemen of the "Fancy," and consequently good ones sell for a high price.

MONGREL HOUNDS, WHICH HUNT SINGLY EITHER BY THE SCENT OR EYE.

The Lurcher.—This variety is smaller than the greyhound, with its limbs stronger and shorter, the head less acute, with short, erect, and half-pricked ears: the whole body and tail are covered with rough coarse hair; it is grizzly about the muzzle, and is of a pale sand-colour, or iron-gray.

The habits of this dog lead him to concealment and cunning; and he is often employed in killing hares and rabbits under the cloud of night, for which nature seems eminently to have fitted him.

The Leymmer, or Leviner.—This dog is supposed to have been a breed betwixt the greyhound and the hound, possessing great swiftness, a keen sense of smelling, and much strength. In figure he bore a great resemblance to the former. He is said to have hunted both by sight and smelling. The leymmer was led in a thong, and slipped at game in the same manner as we do greyhounds; from which practice it derived its name.

The Tumbler.—This dog is somewhat less than a greyhound, with a long lean body; his head is shaped somewhat like that of the latter, with short pricked ears. He is nearly allied to the lurcher, which he strongly resembles in the cunning arts which he uses in taking his prey. Hence his name, as in hunting he does not directly run at the game, but scampers about in a careless and apparently inattentive manner, tumbling himself over till he comes within reach of it, and then seizes it by a sudden spring, somewhat in the manner of one of the feline tribe.

The Turnspit.—This dog is generally long in the body, with short crooked legs; his tail is curled upon his back; his head rather large in proportion to the size of his body: he has for the most part a peculiarity in the colour of his eyes, having the iris of one eye black and the other white. The Turnspit is to be met with of all hues, but the usual one is a bluish-grey, spotted with black,—occasionally he is found of a slate colour. The shape of his head is something between that of the pointer and hound, with long ears. There is a variety of this dog which has straight legs. The Turnspit is a bold, vigilant, and spirited little dog: but its services, which were at one time much valued, have been superseded in Great Britain by the invention of machinery to do his work; he is, in consequence, becoming extremely scarce, and in all probability will soon become extinct, although in France and Germany he is still used in the kitchen. Several instances are recorded of dogs distinguishing the days of the week. In the neighbourhood of some towns there are dogs that regularly repair thither on market-days, because they know that they can procure some booty. Turnspits, that take their hours for labour in regular rotation, know very well how to distinguish the roasting days from the rest; and it is difficult to make them work on the latter, as if they had a notion that then it was more than they were in duty bound to do.

DIVISION III.

HEAD TRUNCATED.

WATCH-DOGS, WHICH HAVE NO PROPENSITY FOR HUNTING.

The Mastiff.—This is a large and powerful animal, much stronger than the bull-dog; his ears are longer and more pendulous; his lips are full and loose, the upper one hanging considerably over the lower at the two extremities; his aspect is grave, and somewhat sullen; and his bark loud, deep-toned, and terrific, particularly during the night. The mastiff differs in form from the bull-dog in being much longer in the legs, and not so deep in the chest; and while his head is large in proportion to his body, he wants the projecting under-jaw of the latter. Buffon was of opinion that the mastiff is not an original race, but a mongrel generated betwixt the Irish greyhound and the bull-dog. This, however, must be mere conjecture; for the mastiff, in his pure and uncontaminated state, has a much more dignified aspect than either of these dogs; and we are rather inclined to believe him to be an original breed peculiar to Britain. We are borne out in this opinion, as we find it on record, that, so early as the times of the Roman emperors, this country was celebrated on account of its dogs of this kind.

The mastiff displays one peculiarity which seems inherent—his ferocity is always increased by the degree of restraint in which he is kept. If constantly on the chain, he is much more dangerous to approach than when in a state of liberty; from whence it evidently appears, that what may be considered a friendly kindness on one side, is always productive of confidence on the other. This dog is naturally possessed of strong instinctive sensibility, speedily obtains a knowledge of all the duties required of him, and discharges them, too, with the most punctual assiduity. In the protection of gardens, houses, wood-yards, and widely extended manufactories, his vigilance is very striking: he makes regular rounds of the whole premises like a watchman, examines every part of them with a careful eye: his penetration reaches even the remotest corner, and not a spot is passed by, until he is satisfied that all is in a state of perfect security. During the night he gives a signal of his presence by repeated and vociferous barkings, which are increased upon the least cause of alarm; and, contrary to the spirit of the bull-dog, whose invariable practice is to bite before he barks, the mastiff always warns before he attacks. This breed is very difficult to be obtained in purity, from the various admixtures and experimental crosses which have taken place. The genuine old English mastiff is now rarely to be seen, although we have dogs of various sizes and colours which go under that name.

The Ban-dog.—This variety is lighter, smaller, and more active than the mastiff, from which he is descended by a cross with the fox-hound. He is not nearly so powerful a dog as the former, but is more fierce in his natural disposition. From his descent he possesses a finer sense of smelling than that dog. His hair is rougher, generally of a yellowish or sandy gray, streaked with shades of black or brown, and semi-curled almost over his whole body; his legs, however, are smooth. Although he generally attacks his adversary in front, like the mastiff and bull-dog, it is not his invariable practice, for he is sometimes seen to seize cattle by the flank. His bite is said to be severe and dangerous.

The Bull-dog.—The bull-dog is low in stature, deep-chested, and strongly made about the shoulders and thighs; the muscles of both of which are extremely developed. His head is broad, his nose short, and the under-jaw projects beyond the upper, which gives him a fierce and disagreeable aspect. His eyes are distant and prominent, and have a peculiar suspicious-like leer, which, with the distension of his nostrils, gives him also a contemptuous look; and from his teeth being always seen, he has the constant appearance of grinning while he is perfectly placid. He is the most ferocious and unrelenting of the canine tribe, and may be considered courageous beyond every other creature in the world; for he will attack any animal, whatever be his magnitude. The bull-dog is scarcely capable of any education, and is fitted for nothing but combat and ferocity. This animal takes his name from his having been employed in former times in assaulting the bull, and he is used for the same purpose at the present day, in those districts where this brutal amusement is still practised. Nothing can exceed the fury with which the bull-dog falls upon all other animals, and the invincible obstinacy with which he maintains his hold. In attacking the bull he always assails him in front, and generally fastens upon his lip, tongue, or eye, where he holds and hangs on, in spite of the most desperate efforts of the other to free himself from his antagonist; which affords ample proof of the amazing strength and power of this animal. Whenever a bull-dog attacks any of the extremities of the body, it is invariably considered a mark of his degeneracy from the original purity of blood. Puppies will assail a bull, and thereby give a decided proof of their breed, when only six months old; and, if permitted, will rather suffer themselves to be destroyed than relinquish the contest.

The Pug-dog.—This variety is nearly allied to the bull-dog (from which he is descended by a cross with the small Danish) in form and general appearance. The chief difference is in its size, being much smaller, and its tail curled upon its back. It differs extremely in another particular, which is in courage, this animal being as timid as the other is valiant.

The Small Danish Dog.—This variety, like the three which follow it, is only a cross originating in the pug-dog and some other diminutive mongrel, or in all probability from a succession of crosses.

The Roquet.—The roquet resembles the small Danish dog in his general shape.

The Mopsie.—The mopsie is a variety of the German pug-dog, and differs from it only in being much more diminutive, and in having a smaller head, the lips thinner, the nose shorter and less turned up.

The Artoise Dog.—This dog is also descended from the pug-dog, crossed with some degenerated variety: his nose is very flat and short. It is supposed that, from this physical construction, he is totally devoid of the sense of smell.

NOTE B.—*Habits of the Wolf.*

Of the habits of the wolves of America, in which part of the world there are several varieties, we have now very accurate descriptions by intelligent and daring travellers. From those narratives, we may form some tolerable idea of the pest which formerly existed in our own country, before their extirpation. During the arduous journeys of Captain Franklin to the shores of the Polar Sea, he and his companions were often obliged to dispute their scanty food with the prowling wolves of those inclement regions. On one occasion, when they had captured a moose-deer, and had buried a part of the body, the wolves absolutely dug it out from their very feet, and devoured it, while the weary men were sleeping. On another occasion, when the travellers had killed a deer, they saw, by the flashes of the aurora borealis, eight wolves waiting around for their share of the prey; and the intense howling of the ferocious animals, and the cracking of the ice by which they were surrounded, prevented them from sleeping even if they had dared. But the wolves were sometimes caterers for the hungry wanderers in these dreary regions. When a group of wolves and a flight of crows were discovered, the travellers knew that there was a carcass to be divided; and they sometimes succeeded in obtaining a share of the prey, if it had been recently killed. Even the wolves have a fear of man; and they would fly before the little band, without attempting resistance. The following anecdote is full of interest:—"Dr. Richardson, having the first watch, had gone to the summit of the hill and remained seated, contemplating the river that washed the precipice under his feet, long after dusk had hid distant objects from his view. His thoughts were, perhaps, far distant from the surrounding scenery, when he was roused by an indistinct noise behind him; and, on looking round, perceived that nine white wolves had ranged themselves in form of a crescent, and were advancing, apparently with the intention of driving him into the river. On his rising up, they halted; and when he advanced, they made way for his passage down to the tents." This circumstance happened when the weather was sultry. The formation of a crescent is the mode generally adopted by a pack of wolves to prevent the escape of any animal which they chase.

The following passage, from the same interesting work, shows the extreme cunning of the wolves in the pursuit of a creature of superior speed: "So much snow had fallen on the night of the 24th, that the track we intended to follow was completely covered; and our march to-day was very fatiguing. We passed the remains of two red deer, lying at the bases of perpendicular cliffs, from the summits of which they had probably been forced by the wolves. These voracious animals, who are inferior in speed to the moose or red deer, are said frequently to have recourse to this expedient, in places where extensive plains are bounded by precipitous cliffs. Whilst the deer are quietly grazing, the wolves assemble in great numbers; and, forming a crescent, creep slowly towards the herd, so as not to alarm them much at first; but when they perceive that they have fairly hemmed in the unsuspecting creatures, and cut off their retreat across the plain, they move more quickly, and with hideous yells terrify their prey, and urge them to flight by the only open way, which is towards the precipice; appearing to know that, when the herd is once at full speed, it is easily driven over the cliff—the rearmost urging on those that are before. The wolves then descend at their leisure, and feast on the mangled carcasses." Thomson, in the fifth book of his 'Winter,' has powerfully described the ferocity of wolves:—

"By wintry famine roused from all the track
Of horrid mountains which the shining Alps,
And wavy Apennine, and Pyrenees,
Branch out stupendous into distant lands,
Cruel as death, and hungry as the grave!
Burning for blood! bony, and gaunt, and grim!
Assembling wolves in raging troops descend,
And, pouring o'er the country, bear along,
Keen as the north wind sweeps the glossy snow.
All is their prize. They fasten on the steed,
Press him to earth, and pierce his mighty heart;
Nor can the bull his awful front defend,
Or shake the murdering savages away.
Rapacious, at the mother's throat they fly,
And tear the screaming infant from her breast.
The god-like face of man avails him nought.
E'en beauty, force divine! at whose bright glance
The generous lion stands in softened gaze,
Here bleeds a hapless, undistinguished prey.'

Ferocious as the wolf of all countries is in the chase of weaker animals, he is ever extremely apprehensive for his own safety. In North America, a bladder hung upon a pole, and blown about by the wind, will deter him from molesting the numerous herds of buffaloes. He is in continual dread of being entrapped to his destruction. He will always attack a rein-deer when loose; but if the animal is tied to a stake, he fears to approach, considering that a pit-fall is near, and that the deer is placed there to entice him to it. The Esquimaux, however, often take him in a trap made of ice, at one end of which is a door of the same abundant material, fitted to slide up and down in a groove; to the upper part of this door a line is attached, and passing over the roof, is led down into the trap at the inner end, and there held by a peg of ice in the ground. Over the peg the bait is fastened; and the whole machinery is concealed by a false roof. Of course when the bait is removed, the line slips off the peg, and the door comes down. This contrivance is quite in character with the surrounding scenery; and thus the wolf is deceived, in spite of his habitual caution. Two were taken at Winter Island in this manner, at the time of Captain Parry's second voyage. The Indians in the neighbourhood of Lake Winnipic, which is the reservoir of several large rivers, and discharges itself by the river Nelson into Hudson's Bay, were, till a very recent period, principally employed in trapping wolves. They were accustomed to make tallow from their fat, and prepare their skins to exchange with the traders from Montreal. The dealers in fur, associated into a company in Canada, exported to England in one year (1798) wolf-skins to the number of three thousand eight hundred. As civilization has advanced in these fine provinces, the Indians, and the beasts of the forests and rivers, have been driven farther and farther into the wilds, onward to the coldest regions. But the trade in furs of North America is still very considerable, and is now principally in the hands of the Hudson's Bay Company. Some idea of the destruction of animal life, to provide for the comforts and luxuries of Europeans, may be formed from the statements which we gather in Captain Franklin's Narrative of his Journey—that, in 1822, the Hudson's Bay Company imported 3,000 skins of the black bear, 60,000 of the pine marten, 1,800 of the fisher (a species of sable), 4,600 of the mink, 7,300 of the otter, 8,000 of the fox, 9,000 of the Canadian lynx, 60,000 of the beaver, 150,000 of the musk rat; beside smaller numbers of the skins of wolves, wolverines, badgers, and racoons.

Amongst the modes of catching or destroying wolves practised by rude nations, Pennant mentions that the Kirghese Cossacs (Tartars) take them by the help of a large hawk called *Berkut*, which is trained to attack them, and will fasten on their head, and deliberately tear out their eyes.

Amidst this constant warfare of mankind against the wolf, it is not surprising that the character of the species should be that of ferocity, cunning, and suspicion; that they should be with difficulty tamed; and that the human race should be to them the object of dread and of aversion. It is probably owing to the influence of the same hereditary fear, that both the male and female wolf are most remarkably solicitous for the protection of their young. The female prepares a nest, or she burrows, (as is the case with most of the American varieties,) in almost inaccessible situations; she lines this retreat with moss, and with her own hair. She suckles her cubs for two months, during which the he-wolf supplies her with food. When they begin to eat, they are fed with half-digested meat, which the parents themselves disgorge; and till the cubs are sufficiently grown to protect themselves—that is, till they are six or eight months old—the parents invariably watch over their safety. The female fox is distinguished in the same manner for the care of her young. It is to this strong affection for their offspring, increasing doubtless with the necessity for protection, that the race of wolves has not, long ago, been extirpated, at least in Europe. Were the young left without the aid of this extraordinary parental care, they would have little chance of escape from the indefatigable hostility of man. A distinguished writer and naturalist of the last age says, "There are no animals destitute of some means to preserve themselves and their kind; and these means so effectual, that notwithstanding all the endeavours and contrivances of man and beast to destroy them, there is not to this day one species lost of such as are mentioned in history." This must be taken with a limitation to the *recent* races of animals—those "mentioned in history;" for the researches of naturalists have discovered fossil remains of animals, differing from any which we at present know. And yet it is by no means certain that some of these animals do not even now exist, although we are unacquainted with them. The kangaroo, and the ornithorhynchus, two of the most extraordinary creatures of Australasia, with which we are now familiar, were unknown to Europeans half-a-century ago. Large tracts of Africa are yet unexplored; and it is possible that the future enterprise of such travellers as those who have already penetrated some distance into those regions, may be successful in discovering either the abodes of civilization, or, what is more probable, new varieties of animal life unsubdued by man, and essentially differing from those of which the human race has already made a conquest.

Note C.—*Of the Hyæna.*

There are only two species of the hyæna now known—the striped and the spotted.

The colour of the striped hyæna is a brownish gray, with transverse bands of dark brown on the body, which stripes become oblique on the flanks and the legs. The hide is composed of two sorts of hair; the fur, or wool, in very small quantity, and the silky hair, long, stiff, and not very thick, excepting on the limbs, where the hair is short and close, and on the muzzle, which is quite shaven, as well as the external face of the ears. The hair upon the line of the back is much thicker and stronger than on any other part, particularly on the withers, forming a sort of mane extending from the nape of the neck to the beginning of the tail, which is also covered with long hair.

The striped hyæna is a native of Barbary, Egypt, Abyssinia, Nubia, Syria, and Persia. This species was known to the ancients, and is described by Aristotle with much correctness. Pliny, however, and other writers on natural history, have left us abundant proof of the extent of human credulity, when employed upon such objects as ferocious animals, whose habits were imperfectly known, and were calculated to produce terror and disgust. The hyæna possesses great strength in the neck, and for this reason, Pliny, and other ancient writers, believed that his neck consisted of one bone without any joint. The ancients considered also, as may be seen by a passage in Lucan's Pharsalia (lib. vi. 672), that this neck without a joint was of peculiar efficacy in magical invocations. Shaw tells us, in his Travels, that the Arabs, when they kill a hyæna, bury the head, lest it should be made the element of some charm against their safety and happiness. It is in this way that superstitions extend themselves through the world, and endure for many generations. The Greeks and Romans believed, too, of the hyæna, that it could change its sex; that it imitated the human voice (the popular name of *laughing* hyæna, is perhaps derived from this notion), and that it had the power of charming the shepherds so as to rivet them to the spot upon which they were met by the quadruped, in the same way that a serpent fascinates a bird. A somewhat similar notion prevailed amongst the poets and naturalists of antiquity with regard to the wolf; they affirming, that if a man encountered a wolf, and the wolf first fixed his eye upon him, he was rendered incapable of speaking, and became permanently dumb. These stories both of the hyæna and the wolf, are evidently exaggerations of the fear which would naturally be produced by the sudden encounter with a ferocious and dangerous animal. Many of the notions of antiquity with regard to the structure and habits of animals, were equally irrational. It was gravely maintained for instance, that the elephant had no joints, and being unable to lie down slept leaning against a tree; that the badger had the legs of one side shorter than those of the other; that the bear brought forth her cubs imperfectly formed, and licked them into shape; that deer lived several hundred years; that the chameleon derived its support solely from the atmospheric air. These, and many other fancies, proceeded either from a literal construction of metaphorical expressions, or a complete ignorance of the economy of nature, with regard to the laws by which animal life is regulated. "There are no grotesques in nature." Such errors as these have long since been exploded, and the cause of real knowledge has been therefore greatly advanced, by the substitution of the true for the fabulous. The popular interest of natural history is not necessarily reduced by this separation of fact from fiction: for the more we examine the operations of nature, the more shall we be sensible of the real wonders which they present; but which, however extraordinary they may appear, are never inconsistent with the great principles of organization, and are never calculated to present any exceptions to the beauty and harmony of that design by which every living thing is formed and sustained.

The spotted hyæna is a native of Southern Africa; and the species is found, in large numbers, in the neighbourhood of the Cape of Good Hope; from this circumstance, Desmarest named it. The general shape of this hyæna is very similar to that of the striped, though it is ordinarily smaller. The mane is remarkable, but not quite so full as in the striped species. The general colour of the hide is a dirty yellow, approaching to a blackish brown on the belly and limbs, with spots also of a blackish brown, more or less deep on all parts of the body, excepting the under part of the belly and of the breast, the inner surface of the limbs, and the head; the extremity of the muzzle is black; the tail is brown, without spots.

The peculiar powers of the hyæna, arising out of the extraordinary strength of his jaws and teeth, admirably fit him for the purposes which he serves in the economy of nature. An inhabitant of warm countries, he principally derives his subsistence, in common with the jackal and the vulture, from those animal remains, which, if unconsumed, would produce the most serious inconvenience. All the narratives of residents in, or travellers through, Southern Africa, agree in their accounts of these facts. Mr. Pringle, in the notes to his "Ephemerides," says, "There are several species of the vulture in South Africa, but the most common is the large light-coloured *vultur percnopterus*, one of the sacred birds of the ancient Egyptians. These fowls divide with the hyænas the office of carrion scavengers; and the prompitude with which they discover and devour every dead carcass is truly surprising. They also instinctively follow any band of hunters, or party of men travelling, especially in solitary places, wheeling in circles high in the air, ready to pounce down upon any game that may be shot and not instantly secured, or the carcass of any ox or other animal that may perish on the road. I have seen a large ox so dexterously handled by a flock of these voracious fowls, that in the course of three or four hours not a morsel, except the bones and the skin, (which they had contrived to disincarnate, almost entire,) remained for the hyænas. In a field of battle in South Africa, no one ever buries the dead; the birds and beasts of prey relieve the living of that trouble. Even the bones, except a few of the less manageable parts, find a sepulchre in the voracious maw of the hyæna." Mr. Burchell, speaking of the office of vultures in hot regions, says, "Vultures have been ordained, evidently to perform very necessary and useful duties on the globe: as, indeed, has every other animated being, however purblind we may be in our views of their utility; and we might almost venture to declare that those duties are the final cause of their existence. To those who have had an opportunity of examining these birds, it need not be remarked how perfectly the formation of a vulture is adapted to that share in the daily business of the globe which has been allotted to it—that of clearing away the putrid or putrescent animal matter, which might otherwise taint the air and produce infectious disease." The vulture is enabled to perform these duties in countries of great extent and thinly scattered population, principally from his extraordinary powers of sight. The wonderful extent of vision of this bird's eye is shown in the following instance:—"In the year 1778, Mr. Baber, and several other gentlemen, were on a hunting party, in the island of Cossimbuzar, in Bengal, about fifteen miles north of the city of Murshedabad. They killed a wild hog of uncommon size, and left it on the ground near the tent. An hour after, walking near the spot where it lay, the sky perfectly clear, a dark spot in the air at a great distance attracted their attention. It appeared to increase in size and move directly towards them: as it advanced, it proved to be a vulture flying in a direct line to the dead hog. In an hour, seventy others *came in all directions*, which induced Mr. Baber to remark, this cannot be smell.[*] The faculty of *smell* of the hyæna conducts him as certainly to his food as the *sight* of the vulture. Major Denham tells us in his Journal, "the hyænas came so close to the tents last night, that a camel which lay about a hundred yards from the enclosure, was found nearly half-eaten. A lion first made a meal on the poor animal, when the hyænas came down upon what he had left." Mr. Burchell says, "A new species of antelope, which had been shot late on the preceding evening, was fetched home; but during the night, the hyænas, or wolves as they are usually called by the Boors and Hottentots, had devoured all the flesh, leaving us only the head and the hide." These and many more instances which we might select show us, that in these regions, in the very hour when any quadruped falls, the sharp-scented hyænas immediately make their appearance, and rush into the encampments of man for their share of the prey. They formerly came down into the town unmolested by the inhabitants, to clear the shambles of their refuse. The common notion that they tear newly-buried bodies out of graves, is not inconsistent with their extraordinary voracity, and the peculiar strength of their claws. It is well ascertained that hyænas devour the dead carcasses of their own species.

But the depredations of the hyæna are not confined to the remains of the dead. There are periods when they become bold from extreme hunger, and will carry off very large animals, and even human beings, with the most daring ferocity. Major Denham says, "At this season of the year" (August), "there are other reasons, besides the falls of rain, which induce people to remain in their habitations. When the great lake overflows, the immense district which in the dry season affords cover and food, by its coarse grass and jungle, to the numerous savage animals with which Bornou abounds, they are driven from these wilds, and take refuge in the standing corn, and sometimes in the immediate neighbourhood of the towns. Elephants had already been seen at Dowergo, scarcely six miles from Kouka, and a female slave, while she was returning home, from weeding the corn, to Kowa, not more than ten miles distant, had been carried off by a lioness. The hyænas, which are everywhere in legions, grew now so extremely ravenous, that a good large village, where I sometimes procured a draught of sour-milk on my duck-shooting excursions, had been attacked the night before my last visit, the town absolutely carried by storm, notwithstanding defences nearly six feet high of branches of the prickly tulloh: and two donkeys, whose flesh these animals are particularly fond of, carried off in spite of the efforts of the people. We constantly heard them close to the walls of our own town at nights; and on a gate being left partly open, they would enter and carry off any unfortunate animal that they could find in the streets."

With this strong desire for food, approaching to the boldness of the most desperate craving, the hyæna, although generally fearful of the presence of man, is an object of natural terror to the African traveller. Bruce relates, that one night in Maibsha, in Abyssinia, he heard a noise in his tent; and getting up from his bed, saw two large blue eyes glaring upon him. It was a powerful hyæna, who had been attracted to the tent by a quantity of candles, which he had seized upon and was carrying away in his mouth. He had a desperate encounter with the beast, but succeeded in killing him. In the neighbourhood of the ruins of those cities on the northern coast of Africa, which in ancient times were the abodes of wealth and splendour, and witnessed the power of the Ptolemies and Cæsars, the hyæna is a constant resident, and increases the sense of desolation by the gloominess of his habits. At Ptolmeta, where there are many remains of former architectural magnificence, the fountains which were constructed for the accommodation of an enormous population are now useless, except to the wandering Arab, and to the jackal and hyæna, who stray amongst these ruins after sunset, to search for water at the deserted reservoirs.[*] Seldom does the hyæna molest the traveller in these solitudes; but his howl or the encounter of his fierce and sullen eye is always alarming. Captain Beechey says, "Although we had very frequently been disturbed by hyænas, we never found that familiarity with their howl, or their presence, could render their near approach an unimportant occurrence; and the hand would instinctively find its way to the pistol, before we were aware of the action, whenever either of these interruptions obtruded themselves closely upon us, either by night or by day." Such encounters are generally without any fatal results, if the man does not commence the attack; the hyæna sets up a howl, and doggedly walks away, with his peculiar limping motion, which gives him an appearance of lameness: but when he is attacked, his resistance is as fierce as it is obstinate.

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[*] Home, Comp. Anat. vol. iii. p. 216.

[*] Beechey.

The hyæna has always been an object of aversion to mankind; and this feeling has been kept up, not only by the showman's stories of "that cruel and untameable beast, that never was yet tamed by man," but by writers of natural history, from the days of Pliny to those of Goldsmith. That the hyæna can be tamed, and most completely and extensively so, there can be no doubt. "The cadaverous *crocuta*," (the spotted hyæna,) says Barrow, in his Travels in South Africa, "has lately been *domesticated* in the Snewberg, where it is now considered one of the best hunters after game, and as faithful and diligent as any of the common sorts of domestic dogs." Bishop Heber saw a gentleman in India, Mr. Traill, who had a hyæna for several years, which followed him about like a dog, and fawned on those with whom he was acquainted: and the Bishop mentions this as an instance of "how much the poor hyæna is wronged, when he is described as untameable." M. F. Cuvier notices an animal of this species that had been taken young at the Cape, and was tamed without difficulty. His keepers had a complete command over his affections. He one day escaped from his cage, and quietly walked into a cottage, where he was retaken without offering any resistance. And yet the rage of this animal was occasionally very great when strangers approached it. The fact is, that the hyæna is exceedingly impatient of confinement; and feels a constant irritation at the constraint which, in the den of a menagerie, is put upon his natural habits. An individual at Exeter Change, some years ago, was so tame, as to be allowed to walk about the exhibition-room. He was afterwards sold to a person, who permitted him to go out with him into the fields, led by a string. After these indulgences, he became the property of a travelling showman, who kept him constantly in a cage. From that time his ferocity became quite alarming; he would allow no stranger to approach him; and he gradually pined away and died. This is one, out of the many examples, of the miseries which we inflict upon animals, through an ignorance of their natural habits: and the same ignorance perpetuates delusions, which even men of talent, like Goldsmith, have adopted; and which still, in the instance before us, leads many to say, with him, "though taken ever so young, the hyæna cannot be tamed." It is very doubtful whether any animal, however fierce, is incapable of being subjected to man. Mr. Barrow procured in Africa a young leopard, which he says "became instantly tame, and as playful as the domestic kitten." He adds, "most beasts of prey, if taken young, may almost instantly be rendered tame. The fierce lion, or the tiger, is sooner reconciled to a state of domestication than the timid antelope." And this is evidently a most wise arrangement of Providence, in order that the progress of civilization, with the dominion which man has over the beasts of the field, shall not necessarily exterminate the races of the inferior animals. The fierce buffalo of the African plains, by an intermixture of breeds, and by training, becomes the patient ox of European communities; the hyæna assists the colonists of the Cape in the business (for to them it is a business) of the chase; the hunting leopard renders the same service to the natives of Hindostan; and the Esquimaux dog is, in all probability, a wolf in a state of servitude.

The subject of hyænas is intimately connected with a most interesting branch of natural science, which it would be wrong here to pass over—we mean the discovery of large quantities of bones, which must have belonged to this tribe at a very distant period, not only in various parts of the European continent, but in our own island. This fact, connected with the discovery, from time to time, of the bones of the elephant, rhinoceros, hippopotamus, crocodile, and other animals, in considerable quantities, is one of the most extraordinary circumstances in the history of the globe; and involves a discussion, whether these bones have been brought hither by some great convulsion of nature, such as the deluge, or whether they belonged to animals which were formerly inhabitants of the island.

Collections of the bones of hyænas have been found, in large quantities, in Franconia, in the Hartz forest, in Westphalia, in Saxony, in Wirtemberg, in Bavaria, and in France. But the most remarkable discovery was that made by Professor Buckland, of Oxford, in a cave at Kirkdale, or Kirby Moorside, Yorkshire, in the summer of 1822. Bones of a similar nature, some in large and some in smaller quantities, had previously been found in different caverns of this country: at Crawley Rocks, near Swansea; in the Mendip Hills, at Clifton; at Wirksworth, in Derbyshire; at Oreston, near Plymouth; and in the cave of Paviland, in Glamorganshire.

The cave of Kirkdale is a natural fissure or cavern, extending three hundred feet into the body of the solid limestone rock, and varying from two to five feet in height and breadth. It was discovered accidentally in the progress of working a stone quarry, as the mouth was closed with rubbish. It is situated on the slope of a hill about one hundred feet above the level of a small river. The bottom of the cavern is nearly horizontal, and is entirely covered, to the depth of about a foot, with a sediment of mud. The surface of this mud is, in some parts, crusted over with limestone, formed by droppings from the roof. At the bottom of this mud, the original floor of the cave is covered with teeth and fragments of bone of the following animals:—the hyæna, the elephant, the rhinoceros, the hippopotamus, the horse, the ox, two or three species of deer, the bear, the fox, the water-rat, and several birds.

The inference which is drawn by Professor Buckland, respecting these bones, is, that they were accumulated before the deluge in this cave or den, and that the black mud with which they are covered over is the sediment left by the waters of the flood. The effect of this mode of preserving them has been, that the bones are not at all mineralized; but actually retain nearly the whole of their animal jelly.

The bones are, for the most part, broken and gnawed to pieces, and the teeth lie loose among the fragments of the bones. Amongst these the teeth of hyænas are most abundant, the greater part of which are worn down almost to the stumps, as if with the operation of gnawing bones. Professor Buckland considers that hyænas must have been the antediluvian inhabitants of the den at Kirkdale, and the other animals, whose bones are found, must have been carried in for food by the hyænas—the smaller animals, perhaps, entire; the large ones piece-meal. Judging from the properties of the remains found in the den, the ordinary food of the hyænas seems to have been oxen, deer, and water-rats; the bones of the larger animals are more rare; and the fact of bones of the hyæna being broken up, equally with the rest, renders it probable that they devoured the dead carcasses of their own species. Many of the bones bear the impress of the canine fangs of the hyæna. Some of the bones and teeth appear to have undergone various stages of decay, by lying in the bottom of the den while it was inhabited; but little or none has taken place since the introduction of the earthy sediment in which they are imbedded.

The discoverer of these remains contends, from the evidence afforded by the interior of this den, that all these animals, whose bones are there found, lived and died in its vicinity; and as the bones belong to the same species which occur in a fossil state in the beds of gravel with which this kingdom abounds, it follows that the period in which they inhabited these regions was that immediately preceding the formation of these gravel beds by some transient and universal inundation, which has left traces of its ravages over the surface of the whole globe. Professor Buckland concludes, that the accuracy of the Mosaic records is thus satisfactorily established in all essential particulars.

The fossil (or extinct) hyæna, according to Cuvier, was about a third larger than the striped species; with the muzzle, in proportion, much shorter. The teeth, as to form, resembled those of the spotted species, but they were considerably larger. The powers of the animal, particularly in its faculty of gnawing bones, were, therefore, greater than those of the existing races.

CHAP. III.

OF ANIMALS OF THE WEASEL KIND.

Having described the bolder ranks of carnivorous animals, we now come to a minuter and more feeble class, less formidable indeed than any of the former, but far more numerous, and, in proportion to their size, more active and enterprising. The weasel kind may be particularly distinguished from other carnivorous animals by the length and slenderness of their bodies, which are so fitted as to wind, like worms, into very small openings, after their prey; and hence also they have received the name of vermin, from their similitude to the worm in this particular. These animals differ from all of the cat kind, in the formation and disposition of their claws, which, as in the dog kinds, they can neither draw in nor extend at pleasure, as cats are known to do. They differ from the dog kind, in being clothed rather with fur than hair; and although some varieties of the fox may resemble them in this particular, yet the coat of the latter is longer, stronger, and always more resembling hair. Besides these distinctions, all animals of the weasel kind have glands placed near the anus, that either open into or beneath it, furnishing a substance that, in some, has the most offensive smell in nature, in others, the most pleasing perfume. All of this kind are still more marked by their habitudes and dispositions than their external form; cruel, voracious, and cowardly, they subsist only by theft, and find their chief protection in their minuteness. They are all, from the shortness of their legs, slow in pursuit; and, therefore, owe their support to their patience, assiduity, and cunning. As their prey is precarious, they live a long time without food; and if they happen to fall in where it is plenty, they instantly destroy all about them before they begin to satisfy their appetite, and suck the blood of every animal before they begin to touch its flesh.

These are the marks common to this kind, all the species of which have a most striking resemblance to each other; and he that has seen one, in some measure may be said to have seen all. The chief distinction in this numerous class of animals is to be taken from the size; for no words can give the minute irregularities of that outline by which one species is to be distinguished from that which is next it. I will begin, therefore, with the least and the best known of this kind, and still marking the size, will proceed gradually to larger and larger, until we come from the weasel to the glutton, which I take to be the largest of all. The weasel will serve as a model for all the rest; and, indeed, the points in which they differ from this little animal are but very inconsiderable.

The weasel,[1] as was said, is the smallest of this numerous tribe; its length not exceeding seven inches, from the tip of the nose to the insertion of the tail. This length, however, seems to be very great, if we compare it with the height of the animal, which is not above an inch and a half. In measuring the wolf, we find him to be not above once and a half as long as he is high; in observing the weasel, we find it near five times as long as it is high, which shows an amazing disproportion. The tail also, which is bushy, is two inches and a half long, and adds to the apparent length of this little animal's body. The colour of the weasel is a pale reddish brown on the back and sides, but white under the throat and the belly. It has whiskers like a cat; and thirty-two teeth, which is two more than any of the cat kind; and these also seem better adapted for tearing and chewing, than those of the cat are. The eyes are little and black; the ears short, broad, and roundish; and have a fold at the lower part, which makes them look as if they were double. Beneath the corners of the mouth, on each jaw, is a spot of brown.

This animal, though very diminutive to appearance, is, nevertheless, a very formidable enemy to quadrupeds a hundred times its own size. It is very common and well known in most parts of this country; but seems held in very different estimation in different parts of it. In those places where sheep or lambs are bred, the weasel is a most noxious inmate, and every art is used to destroy it; on the contrary, in places where agriculture is chiefly followed, the weasel is considered as a friend that thins the number of such vermin as chiefly live upon corn: however, in all places, it is one of the most untameable and untractable animals in the world.[2] When kept in a cage, either for the purposes of amusement or inspection, it will not touch any part of its victuals while any body looks on. It keeps in a continual agitation, and seems frightened so much at the sight of mankind, that it will die, if not permitted to hide itself from their presence.

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[1] British Zoology, vol. i. p. 83.

[2] Buffon, vol. xv. p. 37.

For this purpose, it must be provided in its cage with a sufficient quantity of wool or hay, in which it may conceal itself, and where it may carry whatever it has got to eat; which, however, it will not touch until it begins to putrefy. In this state it is seen to pass three parts of the day in sleeping; and reserves the night for its times of exercise and eating.[3]

In its wild state, the night is likewise the time during which it may be properly said to live. At the approach of evening, it is seen stealing from its hole, and creeping about the farmer's yard for its prey. If it enters the place where poultry are kept, it never attacks the cocks or the old hens, but immediately aims at the young ones. It does not eat its prey on the place, but, after killing it by a single bite near the head, and with a wound so small that the place can scarcely be perceived, it carries it off to its young or its retreat. It also breaks and sucks the eggs, and sometimes kills the hen that attempts to defend them. It is remarkably active; and, in a confined place, scarcely any animal can escape it. It will run up the sides of walls with such facility, that no place is secure from it; and its body is so small, that there is scarcely any hole but what it can wind through. During the summer its excursions are more extensive; but in winter it chiefly confines itself in barns and farm-yards, where it remains till spring, and where it brings forth its young. All this season it makes war upon the rats and mice, with still greater success than the cat; for being more active and slender, it pursues them into their holes, and after a short resistance destroys them. It creeps also into pigeon-holes, destroys the young, catches sparrows, and all kinds of small birds; and, if it has brought forth its young, hunts with still greater boldness and avidity. In summer, it ventures farther from the house; and particularly goes into those places where the rat, its chiefest prey, goes before it. Accordingly, it is found in the lower grounds, by the side of waters, near mills, and is often seen to hide its young in the hollow of a tree.

The female takes every precaution to make an easy bed for her little ones: she lines the bottom of her hole with grass, hay, leaves, and moss, and generally brings forth from three to five at a time. All animals of this, as well as those of the dog kind, bring forth their young with closed eyes: but they very soon acquire strength sufficient to follow the dam in her excursions, and assist her in projects of petty rapine. The weasel, like all others of its kind, does not run on equably, but moves by bounding; and when it climbs a tree, by a single spring it gets a good way from the ground. It jumps in the same manner upon its prey; and having an extremely limber body, evades the attempts of much stronger animals to seize it.

This animal, like all of its kind, has a very strong smell; and that of the weasel is peculiarly fetid. This scent is very distinguishable in those creatures when they void their excrement; for the glands which furnish this fetid substance, which is of the consistence of suet, open directly into the orifice of the anus, and taint the excrement with the strong effluvia. The weasel smells more strongly in summer than in winter; and more abominably when irritated or pursued, than when at its ease. It always preys in silence, and never has a cry except when struck, and then it has a rough kind of squeaking, which at once expresses resentment and pain. Its appetite for animal food never forsakes it; and it seems even to take a pleasure in the vicinity of putrefaction. Mr. Buffon tells us of one of them being found with three young ones in the carcass of a wolf that was grown putrid, and that had been hung up by the hind legs as a terror to others. Into this horrid retreat the weasel thought proper to retire to bring forth her young; she had furnished the cavity with hay, grass, and leaves; and the young were just brought forth when they were discovered by a peasant passing that way.

THE ERMINE, OR STOAT.

Next to the weasel in size, and perfectly alike in figure, is the ermine. The difference between this and the former animal is so very small, that many, and among the rest Linnæus, who gives but one description of both, have confounded the two kinds together. However, their differences are sufficient to induce later naturalists to suppose the two kinds distinct; and as their lights seem preferable, we choose to follow their descriptions.[4]

The stoat or ermine differs from the weasel in size, being usually nine inches long; whereas the former is not much above six. The tail of the ermine is always tipped with black, is longer in proportion to the body, and more furnished with hair. The edges of the ears and the ends of the toes in this animal are of a yellowish white; and although it is of the same colour with the weasel, being of a lightish brown, and though both this animal as well as the weasel, in the most northern parts of Europe, changes its colour in winter, and becomes white, yet even then the weasel may be easily distinguished from the ermine by the tip of the tail, which in the latter is always black.

It is well known that the fur of the ermine is the most valuable of any hitherto known; and it is in winter only that this little animal has it of the proper colour and consistence. In summer, the ermine, as was said before, is brown, and it may at that time more properly be called the *stoat*. There are few so unacquainted with quadrupeds as not to perceive this change of colour in the hair, which in some degree obtains in them all. The horse, the cow, and the goat, all manifestly change colour in the beginning of summer, the old long hair falling off, and a shorter coat of hair appearing in its room, generally of a darker colour, and yet more glossy. What obtains in our temperate climate is seen to prevail still more strongly in those regions where the winters are long and severe, and the summers short, and yet generally hot in an extreme degree. The animal has strength enough during that season to throw off a warm coat of fur which would but incommode it, and continues for two or three months in a state somewhat resembling the ordinary quadrupeds of the milder climates. At the approach of winter, however, the cold increasing, the coat of hair seems to thicken in proportion; from being coarse and short, it lengthens and grows finer, while multitudes of smaller hairs grow up between the longer, thicken the coat, and give it all that warmth and softness which are so much valued in the furs of the northern animals.

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[3] See Supplementary Note, p. 425.

[4] Buffon, British Zoology.

It is no easy matter to account for this remarkable warmth of the furs of northern quadrupeds, or how they come to be furnished with such an abundant covering. It is easy enough, indeed, to say that nature fits them thus for the climate; and like an indulgent mother, when she exposes them to the rigour of an intemperate winter, supplies them with a covering against its inclemency. But this is only flourishing: it is not easy, I say, to tell how nature comes to furnish them in this manner. A few particulars on this subject are all that we yet know. It is observable among quadrupeds, as well as even among the human species itself, that a thin sparing diet is apt to produce hair; children that have been ill fed, famished dogs and horses, are more hairy than others whose food has been more plentiful. This may, therefore, be one cause that the animals of the north, in winter, are more hairy than those of the milder climates. At that season, the whole country is covered with deep snow, and the provisions which these creatures are able to procure can be but precarious and scanty. Its becoming finer may also proceed from the severity of the cold, that contracts the pores of the skin, and the hair consequently takes the shape of the aperture through which it grows, as wires are made smaller by being drawn through a smaller orifice. However this may be, all the animals of the arctic climates may be said to have their winter and summer garments, except very far to the north, as in Greenland, where the cold is so continually intense, and the food so scarce, that neither the bears nor foxes change colour.[5]

The ermine, as was said, is remarkable among these for the softness, the closeness, and the warmth of its fur. It is brown in summer, like the weasel, and changes colour before the winter is begun, becoming a beautiful cream colour, all except the tip of the tail, as was said before, which still continues black. Mr. Daubenton had one of these brought him with its white winter fur, which he put into a cage and kept, in order to observe the manner of its moulting the hair. He received it in the beginning of March; in a very short time it began to shed its coat, and a mixture of brown was seen to prevail among the white; so that at the ninth of the same month, its head was nearly become of a reddish brown. Day after day this colour appeared to extend, at first along the neck and down the back in the manner of a stripe of about half-an-inch broad. The fore part of the legs then assumed the same colour; a part of the head, the thighs, and the tail, were the last that changed; but at the end of the month there was no white remaining except on those parts which are always white in this species, particularly the throat and the belly. However, he had not the pleasure of seeing this animal resume its former whiteness, although he kept it for above two years; which, without doubt, was owing to its imprisoned state; this colour being partly owing to its stinted food, and partly to the rigour of the season. During its state of confinement, this little animal always continued very wild and untractable; for ever in a state of violent agitation, except when asleep, which it often continued for three parts of the day. Except for its most disagreeable scent, it was an extremely pretty creature, its eyes sprightly, its physiognomy pleasant, and its motions so swift that the eye could scarcely attend them. It was fed with eggs and flesh, but it always let them putrefy before it touched either. As some of this kind are known to be fond of honey, it was tried to feed this animal with such food for a while; after having for three or four days deprived it of other food, it ate of this, and died shortly after; a strong proof of its being a distinct species from the polecat or the martin, which feed upon honey, but otherwise pretty much resemble the ermine in their figure and dispositions.

In the north of Europe and Siberia their skins make a valuable article of commerce, and they are found there much more frequently than among us. In Siberia they burrow in the fields, and are taken in traps baited with flesh. In Norway they are either shot with blunt arrows, or taken in traps made of two flat stones, one being propped with a stick to which is fastened a baited string; and when the animals attempt to pull this away, the stone drops and crushes them to death. This animal is sometimes found white in Great Britain, and is then called a white weasel. Its furs, however, among us are of no value, having neither the thickness, the closeness, nor the whiteness of those which come from Siberia. The fur of the ermine, in every country, changes by time; for as much of its beautiful whiteness is given it by certain arts known to the furriers, so its natural colour returns, and its former whiteness can never be restored again.

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[5] Krantz's History of Greenland, vol. i. p. 72.

THE FERRET.

The animal next in size to the ermine is the ferret, which is a kind of domestic in Europe, though said to be originally brought from Africa into Spain, which being a country abounding in rabbits, required an animal of this kind more than any other: however this be, it is not to be found at present among us, except in its domestic state; and it is chiefly kept tame, for the purposes of the warren.

The ferret is about one foot long, being nearly four inches longer than the weasel. It resembles that animal in the slenderness of its body, and the shortness of its legs; but its nose is sharper, and its body more slender, in proportion to its length. The ferret is commonly of a cream colour; but they are also found of all the colours of the weasel kind; white, blackish, brown, and party-coloured. Those that are of the whitish kind have their eyes red, as is almost general with all animals entirely of that colour. But its principal distinction from the weasel, is the length of the hair on its tail, which is much longer in the ferret than in the weasel. Words will not well express the other distinctions; and what might take up a page in dull discrimination, a single glance of the eye, when the animals themselves are presented, can discover.

As this animal is a native of the torrid zone,[6] so it cannot bear the rigours of our climate without care and shelter; and it generally repays the trouble of its keeping, by its great agility in the warren. It is naturally such an enemy of the rabbit kind, that if a dead rabbit be presented to a young ferret, although it has never seen one before, it instantly attacks and bites it with an appearance of rapacity. If the rabbit be living, the ferret is still more eager, seizes it by the neck, winds itself round it, and continues to suck its blood till it be satiated.

Their chief use in warrens is to enter the holes, and drive the rabbits into the nets that are prepared for them at the mouth. For this purpose, the ferret is muzzled; otherwise, instead of driving out the rabbit, it would content itself with killing and sucking its blood at the bottom of the hole; but, by this contrivance, being rendered unable to seize its prey, the rabbit escapes from its claws, and instantly makes to the mouth of the hole with such precipitation, that it is inextricably entangled in the net placed there for its reception. It often happens, however, that the ferret disengages itself of its muzzle, and then it is most commonly lost, unless it be dug out; for, finding all its wants satisfied in the warren, it never thinks of returning to the owner, but continues to lead a rapacious solitary life while the summer continues, and dies with the cold of the winter. In order to bring the ferret from his hole, the owners often burn straw and other substances at the mouth; they also beat above to terrify it: but this does not always succeed; for as there are often several issues to each hole, the ferret is affected neither by the noise nor the smoke, but continues secure at the bottom, sleeping the greatest part of the time, and waking only to satisfy the calls of hunger.

The female of this species[7] is sensibly less than the male, whom she seeks with great ardour, and, it is said, often dies without being admitted. They are usually kept in boxes, with wool, of which they make themselves a warm bed, that serves to defend them from the rigour of the climate. They sleep almost continually; and the instant they awake they seem eager for food. They are usually fed with bread and milk. They breed twice a-year. Some of them devour their young as soon as brought forth, and then become fit for the male again. Their number is usually from five to six at a litter; and this is said to consist of more females than males. Upon the whole, this is a useful, but disagreeable and offensive animal; its scent is fetid, its nature voracious, it is tame without any attachment, and such is its appetite for blood, that it has been known to attack and kill children in the cradle. It is very easy to be irritated; and although at all times its smell is very offensive, it then is much more so; and its bite is very difficult of cure.

To the ferret kind we may add an animal which Mr. Buffon calls the *vansire*, the skin of which was sent him stuffed from Madagascar. It was thirteen inches long, a good deal resembling the ferret in figure, but differing in the number of its grinding-teeth, which amounted to twelve; whereas in the ferret there are but eight: it differed also in colour, being of a dark brown, and exactly the same on all parts of its body. Of this animal, so nearly resembling the ferret, we have no other history but the mere description of its figure; and in a quadruped whose kind is so strongly marked, perhaps this is sufficient to satisfy curiosity.

THE POLECAT.

The polecat is larger than the weasel, the ermine, or the ferret, being one foot five inches long; whereas the weasel is but six inches, the ermine nine, and the ferret eleven inches. It so much resembles the ferret in form, that some have been of opinion they were one and the same animal; nevertheless, there are a sufficient number of distinctions between them: it is, in the first place, larger than the ferret; it is not quite so slender, and has a blunter nose; it differs also internally, having but fourteen ribs, whereas the ferret has fifteen; and wants one of the breast-bones, which is found in the ferret: however, warreners assert that the polecat will mix with the ferret; and they are sometimes obliged to procure an intercourse between these two animals to improve the breed of the latter, which, by long confinement, is sometimes seen to abate of its rapacious disposition. Mr. Buffon denies that the ferret will admit the polecat; yet gives a variety, under the name of both animals, which may very probably be a spurious race between the two.

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[6] Buffon.

[7] Buffon.

However this be, the polecat seems by much the more pleasing animal of the two; for although the long slender shape of all these vermin tribes gives them a very disagreeable appearance, yet the softness and colour of the hair in some of them atones for the defect, and renders them, if not pretty, at least not frightful. The polecat, for the most part, is of a deep chocolate colour; it is white about the mouth; the ears are short, rounded, and tipped with white; a little beyond the corners of the mouth a stripe begins, which runs backward, partly white and partly yellow: its hair, like that of all this class, is of two sorts, the long and the furry; but in this animal the two kinds are of different colours; the longest is black, and the shorter yellowish:[8] the throat, feet, and tail, are blacker than any other parts of the body; the claws are white underneath, and brown above; and its tail is about two inches and a half.

It is very destructive to young game of all kinds;[9] but the rabbit seems to be its favourite prey: a single polecat is often sufficient to destroy a whole warren; for, with that insatiable thirst for blood which is natural to all the weasel kind, it kills much more than it can devour; and I have seen twenty rabbits at a time taken out dead, which they had destroyed, and that by a wound which was hardly perceptible. Their size, however, which is so much larger than the weasel, renders their retreats near houses much more precarious; although I have seen them burrow near a village, so as scarcely to be extirpated. But, in general, they reside in woods or thick brakes, making holes under ground of about two yards deep, commonly ending among the roots of large trees, for greater security. In winter they frequent houses, and make a common practice of robbing the henroost and the dairy.

The polecat is particularly destructive among pigeons,[10] when it gets into a dove-house; without making so much noise as the weasel, it does a great deal more mischief; it despatches each with a single wound in the head; and, after killing a great number, and satiating itself with their blood, it then begins to think of carrying them home. This it carefully performs, going and returning, and bringing them one by one to its hole; but if it should happen that the opening by which it got into the dove-house be not large enough for the body of the pigeon to get through, this mischievous creature contents itself with carrying away the heads, and makes a most delicious feast upon the brains.

It is not less fond of honey; attacking the hives in winter, and forcing the bees away. It does not remove far from houses in winter, as its prey is not so easily found in the woods during that season. The female brings forth her young in summer, to the number of five or six at a time; these she soon trains to her own rapacious habits, supplying the want of milk, which no carnivorous quadruped has in plenty, with the blood of such animals as she happens to seize. The fur of this animal is considered as soft and warm; yet it is in less estimation than some of a much inferior kind, from its offensive smell, which can never be wholly removed or suppressed. The polecat seems to be an inhabitant of the temperate climates,[11] scarcely any being found towards the north, and but very few in the warmer latitudes. The species appears to be confined in Europe, from Poland to Italy. It is certain that these animals are afraid of the cold, as they are often seen to come into houses in winter, and as their tracks are never found in the snow, near their retreats. It is probable, also, that they are afraid of heat, as they are but thinly scattered in the southern climates.

THE MARTEN.

The Marten is a larger animal than any of the former, being generally eighteen inches long, and the tail ten more. It differs from the polecat, in being about four or five inches longer; its tail also is longer in proportion, and more bushy at the end; its nose is flatter; its cry is sharper and more piercing; its colours are more elegant; and, what still adds to their beauty, its scent, very unlike the former, instead of being offensive, is considered as a most pleasing perfume. The marten, in short, is the most beautiful of all the British beasts of prey; its head is small, and elegantly formed; its eyes lively; its ears are broad, rounded, and open; its back, its sides, and tail, are covered with a fine thick downy fur, with longer hair intermixed; the roots are ash-colour, the middle of a bright chestnut, the points black; the head is brown, with a slight cast of red; the legs, and upper sides of the feet, are of a chocolate colour; the palms, or under sides, are covered with a thick down, like that of the body; the feet are broad, the claws white, large, and sharp, well adapted for the purposes of climbing, but, as in others of the weasel kind, incapable of being sheathed or unsheathed at pleasure; the throat and breast are white; the belly of the same colour with the back, but rather paler; the hair on the tail is very long, especially at the end, where it appears much thicker than near the insertion.

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[8] Ray's Synopsis.

[9] British Zoology, vol. i. p. 78.

[10] Buffon.

[11] Buffon.

There is also a variety of this animal, called the *yellow-breasted marten*, which in no respect differs from the former, except that this has a yellow breast, whereas the other has a white one: the colour of the body also is darker; and, as it lives more among trees than the other marten, its fur is more valuable, beautiful, and glossy. The former of these Mr. Buffon calls the *fouine;* the latter, simply the *marten;* and he supposes them to be a distinct species: but as they differ only in colour, it is unnecessary to embarrass history by a new distinction, where there is only so minute a difference.

Of all animals of the weasel kind, the marten is the most pleasing; all its motions show great grace as well as agility; and there is scarcely an animal in our woods that will venture to oppose it. Quadrupeds five times as big are easily vanquished; the hare, the sheep, and even the wild cat itself, though much stronger, is not a match for the marten: and although carnivorous animals are not fond of engaging each other, yet the wild cat and the marten seldom meet without a combat. Gesner tells us of one of this kind that he kept tame, which was extremely playful and pretty; it went among the houses of the neighbourhood, and always returned home when hungry; it was extremely fond of a dog that had been bred up with it, and used to play with it as cats are seen to play, lying on its back, and biting without anger or injury. That which was kept tame by Mr. Buffon, was not quite so social: it was divested of its ferocity, but continued without attachment; and was still so wild as to be obliged to be held by a chain. Whenever a cat appeared, it prepared for war; and if any of the poultry came within its reach, it flew upon them with avidity. Though it was tied by the middle of the body, it frequently escaped: at first it returned after some hours, but without seeming pleased, and as if it only came to be fed: the next time it continued abroad longer; and at last went away without ever returning. It was a female, and was, when it went off, a year and a half old; and Mr. Buffon supposes it to have gone in quest of the male. It ate everything that was given it, except salad or herbs; and it was remarkably fond of honey. It was remarked that it drank often, and often slept for two days together; and that, in like manner, it was often two or three days without sleeping. Before it went to sleep, it drew itself up into a round, hid its head, and covered it with its tail. When awake it was in continual agitation, and was obliged to be tied up, not less to prevent its attacking the poultry, than to hinder it from breaking whatever it came near, by the capricious wildness of its motions.

The yellow-breasted marten is much more common in France than in England; and yet even there this variety is much scarcer than that with the white breast. The latter keeps nearer houses and villages, to make its petty ravages among the sheep and the poultry; the other keeps in the woods, and leads in every respect a savage life, building its nest on the tops of trees, and living upon such animals as are entirely wild like itself. About night-fall it usually quits its solitude to seek its prey, hunts after squirrels, rats, and rabbits; destroys great numbers of birds and their young, takes the eggs from the nest, and often removes them to its own without breaking.[12] The instant the marten finds itself pursued by dogs, for which purpose there is a peculiar breed, that seem fit for this chase only, it immediately makes to its retreat, which is generally in the hollow of some tree, towards the top, and which it is impossible to come at without cutting it down. Their nest is generally the original tenement of the squirrel, which that little animal bestowed great pains in completing; but the marten, having killed and dispossessed the little architect, takes possession of it for its own use, enlarges its dimensions, improves the softness of the bed, and in that retreat brings forth its young. Its litter is never above three or four at a time; they are brought forth with the eyes closed, as in all the rest of this kind, and very soon come to a state of perfection. The dam compensates for her own deficiency of milk, by bringing them eggs and live birds, accustoming them from the beginning to a life of carnage and rapine. When she leads them from the nest into the woods, the birds at once distinguish their enemies, and attend them, as we before observed of the fox, with all the marks of alarm and animosity. Wherever the marten conducts her young, a flock of small birds are seen threatening and insulting her, alarming every thicket, and often directing the hunter in his pursuit. The marten is more common in north America than in any part of Europe. These animals are found in all the northern parts of the world, from Siberia to China and Canada. In every country they are hunted for their furs, which are very valuable, and chiefly so when taken in the beginning of winter. The most esteemed part of the marten's skin is that part of it which is browner than the rest, and stretches along the backbone. Above twelve thousand of these skins are annually imported into England from Hudson's Bay, and above thirty thousand from Canada.[13]

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[12] Brooke's Natural History.

[13] The Guinea marten is of a dark brown colour; its forehead white, and its neck with a long narrow stripe along the side. Its fur is sprinkled with black and white; its snout is long, and of a deep black colour; the crown is whitish gray, and the belly of a fine

THE SABLE.

Most of the classes of the weasel kind would have continued utterly unknown and disregarded, were it not for their furs, which are finer, more glossy, and soft, than those of any other quadruped. Their dispositions are fierce and untameable; their scent generally offensive; and their figure disproportioned and unpleasing. The knowledge of one or two of them would, therefore, have sufficed curiosity: and the rest would probably have been confounded together under one common name, as things useless and uninteresting, had not their skins been coveted by the vain, and considered as capable of adding to human magnificence or beauty.

Of all these, however, the skin of the sable is the most coveted, and held in the highest esteem. It is of a brownish black; and the darker it is it becomes the more valuable. A single skin, though not above four inches broad, is often valued at ten or fifteen pounds;[14] the fur differing from others in this, that it has no grain; so that rub it which way you will, it is equally smooth and unresisting. Nevertheless, though this little animal's robe was so much coveted by the great, its history till of late was but very little known; and we are obliged to Mr. Jonelin for the first accurate description of its form and nature.[15] From him we learn that the sable resembles the marten in form and size, and the weasel in the number of its teeth; for it is to be observed, that whereas the marten has thirty-eight teeth, the weasel has but thirty-four; in this respect, therefore, the sable seems to make the shade between these two animals; being shaped like the one, and furnished with teeth like the other. It is also furnished with very large whiskers about the mouth; its feet are broad, and, as in the rest of its kind, furnished with five claws on each foot. These are its constant marks; but its fur, for which it is so much valued, is not always the same. Some of this species are of a dark brown over all the body, except the ears and throat, where the hair is rather yellow; others are more of a yellowish tincture, their ears and throat being also much paler. These in both are the colours they have in winter, and which they are seen to change in the beginning of the spring; the former becoming of a yellow brown, and the latter of a pale yellow. In other respects they resemble their kind, in vivacity, agility, and inquietude; in sleeping by day, and seeking their prey by night; in living upon smaller animals; and in the disagreeable odour that chiefly characterizes their race.

They generally inhabit along the banks of rivers, in shady places, and in the thickest woods. They leap with great ease from tree to tree, and are said to be afraid of the sun which tarnishes the lustre of their robes. They are chiefly hunted in winter for their skins, during which part of the year they are only in season. They are mostly found in Siberia, and but very few in any other country of the world; and this scarcity it is which enhances their value. The hunting of the sable chiefly falls to the lot of the condemned criminals, who are sent from Russia into these wild and extensive forests, that, for a great part of the year are covered with snow; and in this instance, as in many others, the luxuries and ornaments of the vain are wrought out of the dangers and the miseries of the wretched. These are obliged to furnish a certain number of skins every year, and are punished if the proper quantity be not provided.

The sable is also killed by the Russian soldiers, who are sent into those parts to that end. They are taxed a certain number of skins yearly, like the former, and are obliged to shoot with only a single ball, to avoid spoiling the skin, or else with cross-bows and blunt arrows. As an encouragement to the hunters, they are allowed to share among themselves the surplus of those skins which they thus procure; and this, in the process of six or seven years, amounts to a very considerable sum. A colonel, during his seven years' stay, gains about four thousand crowns for his share, and the common men six or seven hundred each for theirs.

THE ICHNEUMON.

The ichneumon, which some have injudiciously denominated the *cat of Pharaoh*, is one of the boldest and most useful animals of all the weasel kind. In the kingdom of Egypt, where it is chiefly bred, it is used for the same purposes that cats are in Europe, and is even more serviceable, as being more expert in catching mice than they. This animal is usually of the size of the marten, and greatly resembles it in appearance, except that the hair, which is of a grisly black, is much rougher, and less downy. The tail, also, is not so bushy at the end; and each hair in particular has three or four colours, which are seen in different dispositions of its body. Under its rougher hairs, there is a softer fur of a brownish colour, the rough hair being about two inches long, but that of the muzzle extremely short, as likewise that on the legs and paws. However, being long since brought into a domestic state, there are many varieties in this animal; some being much larger than the marten, others much less; some being of a lighter mixture of colours, and some being streaked in the manner of a cat.

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chestnut. The length of the body is in general nearly two feet, and the tail five inches. The woolly marten inhabits Cayenne; the body is about sixteen inches long, and the tail nine. The snout is long and slender; the upper jaw is considerably longer than the lower; its ears are short and rounded, and its legs short and stout. The body is covered with woolly hair, and its tail is long and taper.—Ed.

[14] Regnard.

[15] Buffon, vol. xxvii. p. 113.

The ichneumon, with all the strength of a cat, has more instinct and agility; a more universal appetite for carnage, and a greater variety of powers to procure it.[16] Rats, mice, birds, serpents, lizards, and insects, are all equally pursued; it attacks every living thing which it is able to overcome, and indiscriminately preys on flesh of all kinds. Its courage is equal to the vehemence of its appetite. It fears neither the force of the dog, nor the insidious malice of the cat; neither the claws of the vulture, nor the poison of the viper. It makes war upon all kinds of serpents with great avidity, seizes and kills them, how venomous soever they be; and we are told, that when it begins to perceive the effects of their rage, it has recourse to a certain root, which the Indians call after its name, and assert to be an antidote for the bite of the asp or the viper.

But what this animal is particularly serviceable to the Egyptians for, is, that it discovers and destroys the eggs of the crocodile. It also kills the young ones that have not as yet been able to reach the water: and, as fable usually goes hand in hand with truth, it is said that the ichneumon sometimes enters the mouth of the crocodile, when it is found sleeping on the shore, boldly attacks the enemy in the inside, and at length, when it has effectually destroyed it, eats its way out again.

The ichneumon, when wild, generally resides along the banks of rivers; and in times of inundation makes to the higher ground, often approaching inhabited places in quest of prey. It goes forward silently and cautiously, changing its manner of moving according to its necessities. Sometimes it carries the head high, shortens its body, and raises itself upon its legs; sometimes it lengthens itself, and seems to creep along the ground; it is often observed to sit upon its hind legs like a dog when taught to beg; but more commonly it is seen to dart like an arrow upon its prey, and seize it with inevitable certainty. Its eyes are sprightly, and full of fire, its physiognomy sensible, its body nimble, its tail long, and its hair rough and various. Like all of its kind, it has glands that open behind and furnish an odorous substance. Its nose is too sharp and its mouth too small to permit its seizing things that are large; however, it makes up by its courage and activity its want of arms; it easily strangles a cat, though stronger and larger than itself; and often fights with dogs, which, though never so bold, learn to dread the ichneumon as a formidable enemy. It also takes the water like the otter, and, as we are told, will continue under it much longer.

This animal grows fast, and dies soon. It is found in great numbers in all the southern parts of Asia, from Egypt to Java; and it is also found in Africa, particularly at the Cape of Good Hope. It is domestic, as was said, in Egypt, but in our colder climates it is not easy to breed or maintain them, as they are not able to support the rigour of our winters. Nevertheless, they take every precaution that instinct can dictate to keep themselves warm; they wrap themselves up into a ball, hiding the head between the legs, and in this manner continue to sleep all day long. "Seba had one sent him from the island of Ceylon, which he permitted to run for some months about the house. It was heavy and slothful by day, and often could not be awakened even with a blow; but it made up this indolence by its nocturnal activity, smelling about without either being wholly tame or wholly mischievous. It climbed up the walls and the trees with very great ease, and appeared extremely fond of spiders and worms, which it preferred, probably from their resemblance to serpents, its most natural food. It was also particularly eager to scratch up holes in the ground; and this, added to its wildness and uncleanliness, obliged our naturalist to smother it in spirits in order to preserve, and add it to the rest of his collection."

This animal was one of those formerly worshipped by the Egyptians, who considered every thing that was serviceable to them as an emanation of the Deity, and worshipped such as the best representatives of God below. Indeed, if we consider the number of eggs which the crocodile lays in the sand at a time, which often amount to three or four hundred, we have reason to admire this little animal's usefulness as well as industry in destroying them, since otherwise the crocodile might be produced in sufficient numbers to overrun the whole earth.

THE STINKARDS.

THIS is a name which our sailors give to one or two animals of the weasel kind, which are chiefly found in America. All the weasel kind, as was already observed, have a very strong smell; some of them indeed approaching to a perfume, but the greatest number most insupportably fetid. But the smell of our weasels, and ermines, and polecats, is fragrance itself when compared to that of the *squash* and the *skink*, which have been called the *polecats* of America. These two are found in different parts of America, both differing in colour and fur, but both obviously of the weasel kind, as appears not only from their figure and odour, but also from their disposition. The squash is about the size of a polecat, its hair is of a deep brown, but principally differing from all of this kind in having only four toes on the feet before, whereas all the other weasels have five. The skink, which I take to be Catesby's Virginia polecat, resembles a polecat in shape and size, but particularly differs in the length of its hair and colour. The hair is above three inches and a half long, and that at the end of the tail above four inches. The colour is partly black and partly white, variously disposed over the body, very glossy, long, and beautiful.[17] There seem to be two varieties more of this animal, which Mr. Buffon calls the *conepate* and the *zorille*. He supposes each to be a distinct species: but as they are both said to resemble the polecat in form, and both to be clothed with a long fur of a black and white colour, it seems needless to make a distinction. The conepate resembles the skink in all things except in size, being smaller, and in the disposition of its colours, which are more exact, having five white stripes upon a black ground, running longitudinally from the head to the tail. The zorille resembles the skink, but is rather smaller, and more beautifully coloured, its streaks of black and white being more distinct, and the colours of its tail being black at its insertion and white at the extremity; whereas in the skink they are all of one gray colour.

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[16] The rest of this description is extracted from Mr. Buffon, except where marked with commas.

But whatever differences there may be in the figure or colour of these little animals, they all agree in one common affection, that of being intolerably fetid and loathsome. I have already observed that all the weasel kind have glands furnishing an odorous matter, near the anus, the conduits of which generally have their aperture just at its opening. That substance which is stored up in these receptacles, is in some of this kind, such as in the marten already mentioned, and also in the genet and the civet to be described hereafter, a most grateful perfume; but in the weasel, the ermine, the ferret, and the polecat, it is extremely fetid and offensive. These glands in the animals now under consideration are much larger, and furnish a matter sublimed to a degree of putrescence that is truly amazing. As to the perfumes of musk and civet, we know that a single grain will diffuse itself over a whole house, and continue for months to spread an agreeable odour, without diminution. However, the perfume of the musk or the civet is nothing, either for strength or duration, to the insupportable odour of these. It is usually voided with their excrement; and if but a single drop happens to touch any part of a man's garment, it is more than probable that he can never wear any part of it more.

In describing the effects produced by the excrement of these animals, we often hear of its raising this diabolical smell by its urine. However, of this I am apt to doubt; and it should seem to me, that, as all the weasel kind have their excrements so extremely fetid from the cause above mentioned, we may consider these also as being fetid from the same causes. Besides, they are not furnished with glands to give their urine such a smell; and the analogy between them and the weasel kind being so strong in other respects, we may suppose they resemble each other in this. It has also been said, that they take this method of ejecting their excrement to defend themselves against their pursuers; but it is much more probable that this ejection is the convulsive effect of terror, and that it serves as their defence without their own concurrence. Certain it is, that they never smell thus horridly except when enraged or affrighted, for they are often kept tame about the houses of the planters of America without being very offensive.

The habitudes of all these animals are the same, living like all the rest of the weasel kind, as they prey upon smaller animals and birds' eggs. The squash, for instance, burrows like the polecat in the clefts of rocks, where it brings forth its young. It often steals into farm-yards, and kills the poultry, eating only their brains. Nor is it safe to pursue or offend it, for then it calls up all its scents, which are its most powerful protection. At that time neither men nor dogs will offer to approach it; the scent is so strong that it reaches for half a mile round, and more near at hand is almost stifling. If the dogs continue to pursue, it does all in its power to escape, by getting up a tree, or by some such means; but if driven to an extremity, it then lets fly upon the hunters, and if it should happen that a drop of this fetid discharge falls in the eye, the person runs the risk of being blinded for ever.

The dogs themselves instantly abate of their ardour when they find this extraordinary battery played off against them; they instantly turn tail, and leave the animal undisputed master of the field; and no exhortations can ever bring them to rally. "In the year 1749," says Kalm, "one of these animals came near the farm where I lived. It was in winter time, during the night; and the dogs that were upon the watch pursued it for some time, until it discharged against them.[18] Although, I was in my bed a good way off, I thought I should have been suffocated; and the cows and oxen, by their lowing, showed how much they were affected by the stench. About the end of the same year, another of these animals crept into our cellar, but did not exhale the smallest scent because it was not disturbed. A foolish woman, however, who perceived it at night, by the shining of its eyes, killed it, and at that moment its stench began to spread. The whole cellar was filled with it to such a degree, that the woman kept her bed for several days after, and all the bread, meat, and other provisions that were kept there, were so infected, that they were obliged to be thrown out of doors." Nevertheless, many of the planters and native Americans keep this animal tame about their houses; and seldom perceive any disagreeable scents, except it is injured or frighted. They are also known to eat its flesh, which some assert to be tolerable food; however, they take care to deprive it of those glands which are so horribly offensive.

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[17] The following is Audubon's description of the skunk or polecat:—The animal "is about a foot and a half in length, with a large bushy tail, nearly as long as the body. The colour is generally brownish black, with a large white patch on the back of the head; but there are many varieties of colouring, in some of which the broad white bands of the back are very conspicuous. The polecat burrows, or forms a subterranean habitation among the roots of trees, or in rocky places. It feeds on birds, young hares, rats, mice, and other animals, and commits great depredations on poultry. The most remarkable peculiarity of this animal is the power of squirting, for its defence, a most nauseously-scented fluid contained in a receptacle situated under the tail, which it can do to the distance of several yards. It does not, however, for this purpose, sprinkle its tail with the fluid, as some allege, unless when extremely harassed by its enemies. The polecat is frequently demesticated. The removal of the glands prevents the secretion of the nauseous fluid; and when thus improved, the animal becomes a great favourite, and performs the offices of the common cat with great dexterity."—ED.

[18] Voyage de Kalm, as quoted by Buffon, vol xxvii. p. 93.

THE GENET.

From the squash, which is the most offensive animal in nature, we come to the genet, which is one of the most beautiful and pleasing. Instead of the horrid stench, with which the former affects us, this has a most grateful odour: more faint than civet, but to some for that reason more agreeable. This animal is rather less than the marten; though there are genets of different sizes, and I have seen one rather larger. It also differs somewhat in the form of its body. It is not easy in words to give an idea of the distinction. It resembles all those of the weasel kind in its length, compared to its height; it resembles them in having a soft beautiful fur, in having its feet armed with claws that cannot be sheathed, and in its appetite for petty carnage. But then it differs from them in having the nose much smaller and longer, rather resembling that of a fox than a weasel. The tail, also, instead of being bushy, tapers to a point, and is much longer, its ears are larger, and its paws smaller. As to its colours and figure in general, the genet is spotted with black, upon a ground mixed with red and gray. It has two sorts of hair, the one shorter and softer, the other longer and stronger, but not above half an inch long on any part of its body except the tail. Its spots are distinct and separate upon the sides, but unite towards the back, and form black stripes, which run longitudinally from the neck backwards. It has also along the back a kind of mane or longish hair, which forms a black streak from the head to the tail, which last is marked with rings, alternately black and white its whole length.

The genet, like all the rest of the weasel kinds, has glands, that separate a kind of perfume, resembling civet, but which soon flies off. These glands open differently from those of other animals of this kind; for as the latter have their aperture just at the opening of the anus, these have their aperture immediately under it; so that the male seems, for this reason, to the superficial observer, to be of two sexes.

It resembles the marten very much in its habits and disposition;[19] except that it seems tamed much more easily. Belonius assures us, that he has seen them in the houses at Constantinople as tame as cats; and that they were permitted to run everywhere about, without doing the least mischief. For this reason they have been called the *cats of Constantinople;* although they have little else in common with that animal, except their skill in spying out and destroying vermin. Naturalists pretend that it inhabits only the moister grounds, and chiefly resides along the banks of rivers, having never been found in mountains, nor dry places. The species is not much diffused; it is not to be found in any part of Europe, except Spain and Turkey; it requires a warm climate to subsist and multiply in; and yet it is not to be found in the warmer regions either of India or Africa. From such as have seen its uses at Constantinople, I learn that it is one of the most beautiful, cleanly, and industrious animals in the world; that it keeps whatever house it is in perfectly free from mice and rats, which cannot endure its smell. Add to this, its nature is mild and gentle, its colours various and glossy, its fur valuable; and, upon the whole, it seems to be one of those animals that with proper care might be propagated amongst us, and might become one of the most serviceable of our domestics.

THE CIVET.

Proceeding from the smaller to the greater of this kind, we come in the last place to the civet, which is much larger than any of the former; for as the marten is not above sixteen inches long, the civet is found to be above thirty. Mr. Buffon distinguishes this species into two kinds, one of which he calls the *civet*, and the other the *zibet*. The latter principally differs from the former in having the body longer and more slender, the nose smaller, the ears longer and broader; no mane or long hair running down the back in the latter; and the tail longer, and better marked with rings of different colours, from one end to the other. These are the differences which have induced this great naturalist to suppose them animals of distinct species; and to allot each a separate description. How far future experience may confirm this conjecture, time must discover; but certain it is, that if such small varieties make a separate species, there may be many other animals equally entitled to peculiar distinction that are now classed together.

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[19] Buffon, vol. xix. p. 187.

We shall, therefore, content ourselves, at present, with considering, as former naturalists have done, these two merely as varieties of the same animal, and only altered in figure by climate, food, or education.

The civet resembles animals of the weasel kind in the long slenderness of its body, the shortness of its legs, the odorous matter that exudes from the glands behind, the softness of its fur, the number of its claws, and their incapacity of being sheathed. It differs from them in being much larger than any hitherto described; in having the nose lengthened, so as to resemble that of the fox; the tail long and tapering to a point; and its ears straight, like those of a cat. The colour of the civet varies: it is commonly ash, spotted with black; though it is whiter in the female, tending to yellow; and the spots are much larger, like those of a panther. The colour on the belly, and under the throat, is black; whereas the other parts of the body are black or streaked with gray. This animal varies in its colour, being sometimes streaked, as in our kind of cats called *tabbies*. It has whiskers like the rest of its kind; and its eye is black and beautiful.

The opening of the pouch or bag, which is the receptacle of the civet, differs from that of the rest of the weasel kind, not opening into, but under the anus. Besides this opening, which is large, there is still another lower down; but for what purposes designed is not known. The pouch itself is about two inches and a half broad, and two long; its opening makes a chink from the top downwards, that is about two inches and a half long; and is covered on the edges and within, with short hair; when the two sides are drawn asunder, the inward cavity may be seen, large enough to hold a small pullet's egg; all round this are small glands, opening and furnishing that strong perfume which is so well known, and is found in this pouch of the colour and consistence of pomatum. Those who make it their business to breed these animals for their perfume, usually take it from them twice or thrice a-week, and sometimes oftener. The animal is kept in a long sort of a box, in which it cannot turn round. The person, therefore, opens the box behind, drags the animal backwards by the tail, keeps it in this position by a bar before, and, with a wooden spoon, takes the civet from the pouch as carefully as he can; then lets the tail go, and shuts the box again. The perfume thus procured is put into a vessel, which he takes care to keep shut; and when a sufficient quantity is procured, it is sold to very great advantage.

The civet,[20] although a native of the warmest climates, is yet found to live in temperate, and even cold countries, provided it be defended carefully from the injuries of the air. Wherefore it is not only bred among the Turks, the Indians, and Africans, but great numbers of these animals are also bred in Holland, where this scraping people make no small gain of its perfume. The perfume of Amsterdam is reckoned the purest of any; the people of other countries adulterating it with gums, and other matters, which diminish its value, but increase its weight. The quantity which a single animal affords, generally depends upon its health and nourishment. It gives more in proportion as it is more delicately and abundantly fed. Raw flesh hashed small, eggs, rice, birds, young fowls, and particularly fish, are the kinds of food the civet most delights in. These are to be changed and altered, to suit and entice its appetite, and continue its health. It gets but very little water; and although it drinks but rarely, yet it makes urine very frequently; and, upon such occasions, we cannot, as in other animals, distinguish the male from the female.

The perfume of the civet is so strong that it communicates itself to all parts of the animal's body; the fur is impregnated thereby, and the skin penetrated to such a degree that it continues to preserve the odour for a long time after it is stripped off. If a person be shut up with one of them in a close room, he cannot support the perfume, which is so copiously diffused. When the animal is irritated, as in all the weasel kind, its scent is much more violent than ordinary; and if it be tormented so as to make it sweat, this also is a strong perfume, and serves to adulterate or increase what is otherwise obtained from it. In general, it is sold in Holland for about fifty shillings an ounce; although, like all other commodities, its value alters in proportion to the demand. Civet must be chosen new, of a good consistence, a whitish colour, and a strong disagreeable smell. There is still a very considerable traffic carried on from Bussorah, Calicut, and other places in India, where the animal that produces it is bred; from the Levant also, from Guinea, and especially from Brazil in South America, although Mr. Buffon is of opinion that the animal is a native only of the Old Continent, and not to be found wild in the New. The best civet, however, is furnished, as was observed, by the Dutch, though not in such quantities at present as some years past, when this perfume was more in fashion. Civet is a much more grateful perfume than musk, to which it has some resemblance; and was some years ago used for the same purposes in medicine. But, at present, it is quite discontinued in prescription; and persons of taste or elegance seem to proscribe it even from the toilet. Perfumes, like dress, have their vicissitudes; musk was in peculiar repute until displaced by civet; both gave ground upon discovering the manner of preparing ambergris; and even this is now disused for the less powerful vegetable kinds of fragrance, spirit of lavender or otter of roses.

As to the rest, the civet is said to be a wild fierce animal; and although sometimes tamed, is never thoroughly familiar. Its teeth are strong and cutting, although its claws be feeble and flexible. It is light and active, and lives by prey, as the rest of its kind, pursuing birds, and other small animals that it is able to overcome. They are sometimes seen stealing into the yards and outhouses, to seize upon the poultry; their eyes shine in the night, and it is very probable that they see better in the dark than by day. When they fail of animal food, they are found to subsist upon roots and fruits, and very seldom drink; for which reason they are never found near great waters. They breed very fast in their native climates, where the heat seems to conduce to their propagation; but in our temperate latitudes, although they furnish their perfume in great quantities, yet they are not found to multiply. A proof that their perfume has no analogy with their appetite for generation.

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[20] Buffon, vol. xix.

THE GLUTTON.[21]

I will add but one animal more to this numerous class of the weasel kind; namely, the glutton; which, for several reasons, seems to belong to this tribe, and this only. We have hitherto had no precise description of this quadruped; some resembling it to a badger, some to a fox, and some to a hyæna. Linnæus places it among the weasels, from the similitude of its teeth; it should seem to me to resemble this animal still more, from the great length of its body, and the shortness of its legs, from the softness of its fur, its disagreeable scent, and its insatiable appetite for animal food. Mr. Klein, who saw one of them, which was brought alive from Siberia, assures us that it was about three feet long,[22] and about a foot and a half high. If we compare these dimensions with those of other animals, we shall find that they approach more nearly to the class we are at present describing than any other; and that the glutton may very justly be conceived under the form of a great overgrown weasel. Its nose, its ears, its teeth, and its long bushy tail, are entirely similar; and as to what is said of its being rather corpulent than slender, it is most probable that those who described it thus, saw it after eating, at which time its belly, we are assured, is most monstrously distended: however, suspending all certainty upon this subject, I will take leave rather to follow Linnæus than Buffon, in describing this animal; and leave future experience to judge between them.

The glutton, which is so called from its voracious appetite, is an animal found as well in the north of Europe and Siberia, as in the northern parts of America, where it has the name of the *carcajou*. Amidst the variety of descriptions which have been given of it, no very just idea can be formed of its figure; and, indeed, some naturalists, among whom was Ray, entirely doubted of its existence. From the best accounts, however, we have of it, the body is thick and long, the legs short; it is black along the back, and of a reddish brown on the sides; its fur is held in the highest estimation for its softness and beautiful gloss; the tail is bushy, like that of the weasel, but rather shorter; and its legs and claws are better fitted for climbing trees than for running along the ground. Thus far it entirely resembles the weasel; and its manner of taking its prey is also by surprise, and not by pursuit.

Scarcely any of the animals with short legs and long bodies pursue their prey; but, knowing their own incapacity to overtake it by swiftness, either creep upon it in its retreats, or wait in ambush and seize it with a bound. The glutton, from the make of its legs and the length of its body, must be particularly slow; and, consequently, its only resource is in taking its prey by surprise. All the rest of the weasel kind, from the smallness of their size, are better fitted for a life of insidious rapine than this; they can pursue their prey into its retreats, they can lurk unseen among the branches of trees, and hide themselves with ease under the leaves: but the glutton is too large to follow small prey into their retreats; nor would such, even if obtained, be sufficient to sustain it. For these reasons, therefore, this animal seems naturally compelled to the life for which it has long been remarkable. Its only resource is to climb a tree, which it does with great ease, and there it waits with patience until some large animal passes underneath, upon which it darts down with unerring certainty, and destroys it.

It is chiefly in North America that this voracious creature is seen lurking among the thick branches of trees, in order to surprise the deer, with which the extensive forests of that part of the world abound. Endued with a degree of patience equal to its rapacity, the glutton singles out such trees as it observes marked by the teeth or the antlers of the deer; and is known to remain there watching for several days together If it has fixed upon a wrong tree, and finds that the deer have either left that part of the country, or cautiously shun the place, it reluctantly descends, pursues the beaver to its retreat, or even ventures into the water in pursuit of fishes. But if it happens that, by long attention and keeping close, at last the elk or the rein-deer happens to pass that way, it at once darts upon them, sticks its claws between their shoulders, and remains there unalterably firm. It is in vain that the large frighted animal increases its speed, or threatens with its branching horns; the glutton having taken possession of its post, nothing can drive it off; its enormous prey drives rapidly along among the thickest woods, rubs itself against the largest trees, and tears down the branches with its expanded horns; but still its insatiable foe sticks behind, eating its neck and digging its passage to the great blood-vessels that lie in that part. Travellers who wander through those deserts, often see pieces of the glutton's skin sticking to the trees, against which it was rubbed by the deer. But the animal's voracity is greater than its feelings, and it never seizes without bringing down its prey. When, therefore, the deer, wounded and feeble with the loss of blood, falls, the glutton is seen to make up for its former abstinence by its present voracity. As it is not possessed of a feast of this kind every day, it resolves to lay in a store to serve it for a good while to come. It is, indeed, amazing how much one of these animals can eat at a time! That which was seen by Mr. Klein, although without exercise or air, although taken from its native climate, and enjoying but an indifferent state of health, was yet seen to eat thirteen pounds of flesh every day, and yet remain unsatisfied. We may, therefore, easily conceive how much more it must devour at once, after a long fast, of a food of its own procuring, and in the climate most natural to its constitution. We are told, accordingly, that from being a lank, thin animal, which it naturally is, it then gorges in such quantities, that its belly is distended, and its whole figure seems to alter. Thus voraciously it continues eating, till, incapable of any other animal function, it lies totally torpid by the animal it has killed; and in this situation continues for two or three days. In this loathsome and helpless state, it finds its chief protection from its horrid smell, which few animals care to come near;[23] so that it continues eating and sleeping till its prey be devoured, bones and all, and then it mounts a tree, in quest of another adventure.

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[21] This animal is now ascertained to be a species of bear. It is about three feet long, besides the tail, which is a foot in length. Its size is equal to that of the common fox, though, like others of its tribe, it is of a more clumsy make, and its back is more convex. Its general colour is a blackish brown, with the sides paler. The variety called the Wolverine is distinguished by its superior size, in the colour of its body, which is dull ferruginous, with the front, throat, and longitudinal stripe on the body, whitish.—Ed.

[22] He says, it was an ell and eight inches long: I have, therefore, given its length, as supposing it to be a Flemish ell, which is 27 inches

The glutton, like many others of the weasel kind, seems to prefer the most putrid flesh to that newly killed; and such is the voraciousness of this hateful creature, that, if its swiftness and strength were equal to its rapacity, it would thin the forest of every other living creature. But, fortunately, it is so slow, that there is scarcely a quadruped that cannot escape it, except the beaver. This, therefore, it very frequently pursues upon land; but the beaver generally makes good its retreat by taking to the water, where the glutton has no chance to succeed. This pursuit only happens in summer; for in the winter all that remains is to attack the beaver's house, as at that time it never stirs from home. This attack, however, seldom succeeds; for the beaver has a covert way bored under the ice, and the glutton has only the trouble and disappointment of sacking an empty town.

A life of necessity generally produces a good fertile invention. The glutton, continually pressed by the call of appetite, and having neither swiftness nor activity to satisfy it, is obliged to make up by stratagem the defects of nature. It is often seen to examine the traps and the snares laid for other animals, in order to anticipate the fowlers. It is said to practise a thousand arts to procure its prey, to steal upon the retreats of the rein-deer, the flesh of which animal it loves in preference to all others; to lie in wait for such animals as have been maimed by the hunters; to pursue the isatis while it is hunting for itself; and when that animal has run down its prey, to come in and seize upon the whole, and sometimes to devour even its poor provider: and when these pursuits fail, even to dig up the graves, and fall upon the bodies interred there, devouring them bones and all.[24] For these reasons, the natives of the countries where the glutton inhabits hold it in utter detestation, and usually term it the vulture of quadrupeds. And yet it is extraordinary enough, that being so very obnoxious to man it does not seem to fear him. We are told by Gmelin of one of these coming up boldly and calmly where there were several persons at work, without testifying the smallest apprehension, or attempting to run, until it had received several blows, that at last totally disabled it. In all probability it came among them seeking its prey; and, having been used to attack animals of inferior strength, it had no idea of a force superior to its own. The glutton, like all the rest of its kind, is a solitary animal, and is never seen in company except with its female, with which it couples in the midst of winter. The latter goes with young about four months, and brings forth two or three at a time.[25] They burrow in holes as the weasel; and the male and female are generally found together, both equally resolute in defence of their young. Upon this occasion the boldest dogs are afraid to approach them; they fight obstinately, and bite most cruelly. However, as they are unable to escape by flight, the hunters come to the assistance of the dogs, and easily overpower them. Their flesh, it may readily be supposed, is not fit to be eaten, but the skins amply recompense the hunters for their toil and danger. The fur has the most beautiful lustre that can be imagined, and is preferred before all others except the Siberian fox, or the sable. Among other peculiarities of this animal Linnæus informs us, that it is very difficult to be skinned; but from what cause, whether its absminable stench, or the skin's tenacity to the flesh, he has not thought fit to inform us.

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[23] Linnæi Systema, p. 67.

[24] Buffon.

[25] Linnæi Systema, p. 67.

Note.—*Of the Weasel.*

Instances are not wanting to prove that the weasel may be brought into complete subjection. Mademoiselle de Laistre, in a letter on this subject, gives a very pleasing account of the education and manners of a weasel which she took under her protection, and which frequently ate from her hand, seemingly more delighted with this manner of feeding than any other. "If I pour," says this lady, "some milk into my hand, it will drink a good deal; but if I do not pay it this compliment it will scarcely take a drop. When satisfied it generally goes to sleep. My chamber is the place of its residence; and I have found a method of dispelling its strong smell by perfumes. By day it sleeps in a quilt, into which it gets by an unsewn place which it had discovered on the edge; during the night, it is kept in a wired box or cage, which it always enters with reluctance, and leaves with pleasure. If it be set at liberty before my time of rising, after a thousand little playful tricks, it gets into my bed, and goes to sleep on my hand or on my bosom. If I am up first, it spends a full half hour in caressing me; playing with my fingers like a little dog, jumping on my head and on my neck, and running round on my arms and body with a lightness and elegance which I never found in any other animal. If I present my hands at the distance of three feet, it jumps into them without ever missing. It shows a great deal of address and cunning in order to compass its ends, and seems to disobey certain prohibitions merely through caprice. During all its actions it seems solicitous to divert, and to be noticed; looking at every jump, and at every turn, to see whether it be observed or not. If no notice be taken of its gambols, it ceases them immediately, and betakes itself to sleep; and when awaked from the soundest sleep, it instantly resumes its gaiety, and frolics about in as sprightly a manner as before. It never shows any ill-humour, unless when confined, or teased too much; in which case it expresses its displeasure by a sort of murmur, very different from that which it utters when pleased. In the midst of twenty people, this little animal distinguishes my voice, seeks me out, and springs over every body to come to me. His play with me is the most lovely and caressing; with his two little paws he pats me on the chin with an air and manner expressive of delight. This and a thousand other preferences, show that his attachment is real. When he sees me dressed to go out, he will not leave me, and it is not without some trouble that I can disengage myself from him; he then hides himself behind a cabinet near the door, and jumps upon me as I pass, with so much celerity, that I often can scarcely perceive him. He seems to resemble a squirrel in vivacity, agility, voice, and his manner of murmuring. During the summer he squeaks and runs all the night long; and since the commencement of the cold weather I have not observed this. Sometimes when the sun shines while he is playing on the bed, he turns and tumbles about, and murmurs for a while.

"From his delight in drinking milk out of my hand, into which I pour a very little at a time, and his custom of sipping the little drops and edges of the fluid, it seems probable that he drinks dew in the same manner. He very seldom drinks water, and then only for the want of milk; and with great caution, seeming only to refresh his tongue once or twice, and to be even afraid of that fluid. During the hot weather it rained a good deal; I presented to him some rain-water in a dish, and endeavoured to make him go into it, but could not succeed. I then wetted a piece of linen cloth in it, and put it near him, when he rolled upon it with extreme delight. One singularity in this charming animal is his curiosity; it being impossible to open a drawer or a box, or even to look at a paper but it will examine it also. If he gets into any place where I am afraid to let him stay, I take a paper or a book, and look attentively at it, when he immediately runs upon my hand, and surveys with an inquisitive air whatever I happen to hold.—I must further observe, that he plays with a young cat and dog, both of some size; getting about their necks and paws without their doing him the least harm."

The usual method of taming these creatures is, to stroke them gently over the back; and to threaten, and even to beat them, when they attempt to bite. Aldrovandus observes, that their teeth should be rubbed with garlic, which will take away all their inclination to bite.

The motion of these animals consists of unequal leaps; and, on occasion, they have the power of springing some feet from the ground. They are remarkably active, and will run up a wall with such facility, that no place is secure from them. Their bite is generally fatal, as they seize their prey near the head, and fix their teeth into a vital part. The wound is so minute, that the place where the teeth enter is hardly perceptible; but a hare, rabbit, or other small animal, bitten in this manner, is never known to recover.

The following story regarding the weasel is told in Selkirkshire.—"A group of haymakers, while busy at their work on Chapelhope meadow, at the upper end of St. Mary's Loch (or rather of the Loch of the Lowes, which is separated from it by a narrow neck of land), saw an eagle rising above the steep mountains that enclose the narrow valley. The eagle himself was, indeed, no unusual sight; but there is something so imposing and majestic in the flight of this noble bird, while he soars upwards in spiral circles, that it fascinates the attention of most people.* But the spectators were soon aware of something peculiar in the flight of the bird they were observing. He used his wings violently; and his strokes were often repeated, as if he had been alarmed and hurried by unusual agitation; and they noticed, at the same time, that he wheeled in circles that seemed constantly decreasing, while his ascent was proportionally rapid. The now idle haymakers drew together in close consultation on the singular case, and continued to keep their eyes on the seemingly distressed eagle, until he was nearly out of sight, rising still higher and higher into the air. In a short while, however, they were all convinced that he was again seeking the earth, evidently not as he ascended, in spiral curves; it was like something falling, and with great rapidity. But, as he approached the ground, they clearly saw that he was tumbling in his fall like a shot bird; the convulsive fluttering of his powerful wings stopping the descent but very little, until he fell at a small distance from the men and boys of the party, who had naturally ran forward, highly excited by the strange occurrence. A large black-tailed weasel or stoat ran from the body as they came near, turned with the usual *nonchalance* and impudence of the tribe, stood up upon its hind legs, crossed its fore paws over its nose, and surveyed its enemies a moment or two (as they often do when no dog is near), and bounded into a saugh bush. The king of the air was dead; and, what was more surprising, he was covered with his own blood; and, upon further examination, they found his throat cut, and the stoat has been suspected as the regicide unto this day." This singular story, says a correspondent in the Magazine of Natural History, I always looked upon as too good to be true, until lately a friend mentioned the following fact which came under his own observation:—A light snow covered the ground; and he, having walked out to an adjoining hill to meet with one of his shepherds, fell in with the track of one of these weasels, which is easily to be distinguished from that of the smaller species, by the larger footprint and length of the spring, among the snow. He followed the track for some time, for his amusement, along the side of the hill, until he came to the marks where a pair of grouse had been sitting, when he lost all traces of the weasel, and could follow it no farther. As there was no appearance of a hole he was much surprised; and paying close attention to the track of the animal, he came to be convinced that it had sprung upon one of the birds, which had flown away with it. As he is a person of uncommonly acute observation, sound judgment, and strong sense, I have the utmost confidence in the correctness of his judgment regarding this curious circumstance. The conclusion is, that the stoat knew quite well what it was about, and would keep its hold until it came to the ground again, under similar circumstances with the eagle. The matchless agility and comparative strength of this bold little creature would enable it to save itself during the fall; before which took place, it had probably, as in the former strange instance, destroyed the life of its more harmless prey.

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* In general, the motion of his wings is hardly perceptible; an impetus is given, but the stroke is far between, and he seems impelled by some invisible power.

BOOK VI.

ANIMALS OF THE HARE KIND.

CHAP. I.

INTRODUCTION.

HAVING described in the last chapter a tribe of minute, fierce, rapacious animals, I come now to a race of minute animals of a more harmless and gentle kind, that, without being enemies to any, are preyed upon by all. As Nature has fitted the former for hostility, so it has entirely formed the latter for evasion; and as the one kind subsist by their courage and activity, so the other find safety from their swiftness and their fears. The hare is the swiftest animal in the world for the time it continues; and few quadrupeds can overtake even the rabbit, when it has but a short way to run. To this class also we may add the squirrel, somewhat resembling the hare and rabbit in its form and nature, and equally pretty, inoffensive, and pleasing.[1]

If we were methodically to distinguish animals of the hare kind from all others, we might say that they have but two cutting teeth above and two below, that they are covered with a soft downy fur, and that they have a bushy tail. The combination of these marks might perhaps distinguish them tolerably well; whether from the rat, the beaver, the otter, or any other most nearly approaching in form. But, as I have declined all method that rather tends to embarrass history than enlighten it, I am contented to class these animals together for no very precise reason, but because I find a general resemblance between them in their natural habits, and in the shape of their heads and body. I call a squirrel an animal of the hare kind, because it is something like a hare. I call the paca of the same kind, merely because it is more like a rabbit than any other animal I know of. In short, it is fit to erect some particular standard in the imagination of the reader, to refer him to some animal that he knows, in order to direct him in conceiving the figure of such as he does not know. Still, however, he should be apprized that his knowledge will be defective without an examination of each particular species; and that saying an animal is of this or that particular kind is but a very trifling part of its history.

Animals of the hare kind, like all others that feed entirely upon vegetables, are inoffensive and timorous. As Nature furnishes them with a most abundant supply, they have not that rapacity after food remarkable in such as are often stinted in their provision. They are extremely active and amazingly swift, to which they chiefly owe their protection; for being the prey of every voracious animal, they are incessantly pursued. The hare, the rabbit, and the squirrel, are placed by Pyerius, in his Treatise of Ruminating Animals, among the number of those that chew the cud; but how far this may be true, I will not pretend to determine. Certain it is that their lips continually move whether sleeping or waking. Nevertheless they chew their meat very much before they swallow it, and for that reason I should suppose it does not want a second mastication. All these animals use their forepaws like hands; they are remarkably salacious, and are furnished by Nature with more ample powers than most others for the business of propagation. They are so very prolific, that were they not thinned by the constant depredations made upon them by most other animals, they would quickly overrun the earth.

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[1] The animals of this family have two front teeth in each jaw; those in the upper jaw are doubled, having two smaller ones standing behind the others: they feed entirely on vegetables, are very small, and run by a kind of leaping: they have five toes on the fore-feet, and four on the hinder.—ED.

THE HARE.

Of all these the hare is the largest, the most persecuted, and the most timorous; all its muscles are formed for swiftness; and all its senses seem only given to direct its flight. It has very large prominent eyes, placed backwards in its head, so that it can almost see behind it as it runs. These are never wholly closed; but as the animal is continually upon the watch, it sleeps with them open. The ears are still more remarkable for their size; they are moveable, and capable of being directed to every quarter; so that the smallest sounds are readily received, and the animal's motions directed accordingly. The muscles of the body are very strong, and without fat, so that it may be said to carry no superfluous burden of flesh about it; the hinder feet are longer than the fore, which still adds to the rapidity of its motions; and almost all animals that are remarkable for their speed, except the horse, are formed in the same manner.

An animal so well formed for a life of escape, might be supposed to enjoy a state of tolerable security; but as every rapacious creature is its enemy, it but very seldom lives out its natural term. Dogs of all kinds pursue it by instinct, and follow the hare more eagerly than any other animal. The cat and the weasel kinds are continually lying in ambush, and practising all their little arts to seize it; birds of prey are still more dangerous enemies, as against them no swiftness can avail, nor retreat secure; but man, an enemy far more powerful than all, prefers its flesh to that of other animals, and destroys greater numbers than all the rest. Thus pursued and persecuted on every side, the race would long since have been totally extirpated, did it not find a resource in its amazing fertility.

The hare multiplies exceedingly; it is in a state of engendering at a few months old; the female goes with young but thirty days, and generally brings forth three or four at a time.[2] As soon as they have produced their young, they are again ready for conception, and thus do not lose any time in continuing the breed. But they are in another respect fitted in an extraordinary manner for multiplying their kind; for the female, from the conformation of her womb, is often seen to bring forth, and yet to continue pregnant at the same time; or, in other words, to have young ones of different ages in her womb together. Other animals never receive the male when pregnant, but bring forth their young at once. But it is frequently different with the hare; the female often, though already impregnated, admitting the male, and thus receiving a second impregnation. The reason of this extraordinary circumstance is, that the womb in these animals is divided in such a manner that it may be considered as a double organ, one side of which may be filled while the other remains empty. Thus these animals may be seen to couple at every period of their pregnancy, and even while they are bringing forth young, laying the foundation of another brood.

The young of these animals are brought forth with their eyes open, and the dam suckles them for twenty days, after which they leave her, and seek out for themselves.[3] From this we observe, that the education these animals receive is but trifling, and the family connexion but of short duration. In the rapacious kinds the dam leads her young forth for months together; teaches them the arts of rapine; and, although she wants milk to supply them, yet keeps them under her care until they are able to hunt for themselves. But a long connexion of this kind would be very unnecessary as well as dangerous to the timid animals we are describing; their food is easily procured; and their associations, instead of protection, would only expose them to their pursuers. They seldom, however, separate far from each other, or from the place where they were produced; but make each a form at some distance, having a predilection rather for the place than each other's society. They feed during the night rather than by day, choosing the more tender blades of grass, and quenching their thirst with the dew. They live also upon roots, leaves, fruits, and corn, and prefer such plants as are furnished with a milky juice. They also strip the bark of trees during the winter, there being scarcely any that they will not feed on, except the lime or the alder. They are particularly fond of birch, pinks, and parsley. When they are kept tame, they are fed with lettuce and other garden herbs; but the flesh of such as are thus brought up is always indifferent.

They sleep or repose in their forms by day, and may be said to live only by night.[4] It is then that they go forth to feed and couple. They do not pair, however, but in the rutting season, which begins in February; the male pursues and discovers the female by the sagacity of its nose. They are then seen by moonlight, playing, skipping, and pursuing each other; but the least motion, the slightest breeze, the falling of a leaf, is sufficient to disturb their revels; they instantly fly off, and each takes a separate way.

As their limbs are made for running, they easily outstrip all other animals in the beginning; and could they preserve their speed, it would be impossible to overtake them; but as they exhaust their strength at their first efforts, and double back to the place they were started from, they are more easily taken than the fox, which is a much slower animal than they. As their hind legs are longer than the fore, they always choose to run up hill, by which the speed of their pursuers is diminished, while theirs remains the same. Their motions are also without any noise, as they have the sole of the foot furnished with hair; and they seem the only animals that have hair on the inside of their mouths.

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[2] Buffon, vol. xiii. p. 12.

[3] Buffon, vol. xiii. p. 12.

[4] Ibid.

They seldom live above seven or eight years at the utmost; they come to their full perfection in a year; and this multiplied by seven, as in other animals, gives the extent of their lives.[5] It is said, however, that the females live longer than the males; of this Mr. Buffon makes a doubt; but I am assured that it is so. They pass their lives, in our climate, in solitude and silence; and they seldom are heard to cry, except when they are seized or wounded. Their voice is not so sharp as the note of some other animals, but more nearly approaching that of the squalling of a child. They are not so wild as their dispositions and their habits seem to indicate; but are of a complying nature, and easily susceptible of a kind of education. They are easily tamed. They even become fond and caressing, but they are incapable of attachment to any particular person, and never can be depended upon; for, though taken never so young, they regain their native freedom at the first opportunity. As they have a remarkably good ear, and sit upon their hind legs, and use their fore-paws as hands, they have been taught to beat the drum, to dance to music, and go through the manual exercise.

But their natural instincts for their preservation are much more extraordinary than those artificial tricks that are taught them. They make themselves a form, particularly in those places where the colour of the grass most resembles that of their skin; it is open to the south in winter, and to the north in summer. The hare, when it hears the hounds at a distance, flies for some time through a natural impulse, without managing its strength, or consulting any other means but speed for its safety. Having attained some hill or rising ground, and left the dogs so far behind that it no longer hears their cries, it stops, rears on its hinder legs, and at length looks back to see if it has not lost its pursuers. But these, having once fallen upon the scent, pursue slowly and with united skill, and the poor animal soon again hears the fatal tidings of their approach. Sometimes when sore hunted it will start a fresh hare, and squat in the same form; sometimes it will creep under the door of a sheep-cot, and hide among the sheep; sometimes it will run among them, and no vigilance can drive it from the flock; some will enter holes like the rabbit, which the hunters call going to *vault;* some will go up one side of the hedge and come down the other; and it has been known that a hare sorely hunted has got upon the top of a quick-set hedge, and run a good way thereon, by which it has effectually evaded the hounds. It is no unusual thing also for them to betake themselves to furze bushes, and to leap from one to another, by which the dogs are frequently misled. However, the first doubling a hare makes is generally a key to all its future attempts of that kind, the latter being exactly like the former. The young hares tread heavier, and leave a stronger scent than the old, because their limbs are weaker; and the more this forlorn creature tires, the heavier it treads, and the stronger is the scent it leaves. A buck, or male hare, is known by its choosing to run upon hard highways, feeding farther from the wood-sides, and making its doublings of a greater compass than the female. The male having made a turn or two about its form, frequently leads the hounds five or six miles at a stretch; but the female keeps close by some covert side, turns, crosses, and winds among the bushes like a rabbit, and seldom runs directly forward. In general, however, both male and female regulate their conduct according to the weather. In a moist day they hold by the highways more than at any other time, because the scent is then strongest upon the grass. If they come to the side of a grove or spring, they forbear to enter, but squat down by the side thereof until the hounds have overshot them; and then, turning along their former path, make to their old form, from which they vainly hope for protection.[6]

Hares are divided, by the hunters, into mountain and measled hares. The former are more swift, vigorous, and have their flesh better tasted; the latter chiefly frequent the marshes, when hunted keep among low grounds, and their flesh is moist, white, and flabby. When the male and female keep one particular spot, they will not suffer any strange hare to make its form in the same quarter; so that it is usually said, that the more you hunt, the more hares you shall have; for, having killed one hare, others come and take possession of its form. Many of these animals are found to live in woods and thickets, but they are naturally fonder of the open country, and are constrained only by fear to take shelter in places that afford them neither a warm sun nor an agreeable pasture. They are therefore usually seen stealing out of the edges of the wood to taste the grass that grows shorter and sweeter in the open fields than under the shade of the trees; however, they seldom miss of being pursued; and every excursion is a new adventure. They are shot at by poachers; traced by their footsteps in the snow; caught in springs; dogs, birds, and cats, are all combined against them; ants, snakes, and adders, drive them from their forms, especially in summer; even fleas, from which most other animals are free, persecute this poor creature; and so various are its enemies, that it is seldom permitted to reach even that short term to which it is limited by nature.

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[5] Buffon, vol. xiii. p. 12.

[6] An old hare, when hunted by a common hound, seems to regulate her flight from the very first according to the speed of her pursuer. She seems to know from experience, that very rapid flight would be less certain of carrying her out of the reach of danger than a more deliberate one whereby the chase is protracted to a greater length of time, and she can continue the exertion of her strength longer than if she exerted her full speed at first. She seems to have observed, that in grounds where there are many young shrubs, the contact of her body leaves behind her a stronger scent, and one which makes the dogs pursue her with much greater ardour and perseverance than in level plains, over which the wind skims but slightly. She therefore avoids all thickets, and keeps as much as possible upon beaten roads; but when she is pursued by greyhounds, she runs from them as fast as she is able, and seeks for shelter in woods and thickets. Knowing that harriers, even though they do not see her, can follow her track, she often practises an admirable stratagem to deceive them. When she has run on a considerable way in a straight line, she returns a small distance upon the road she has come, in order to render the scent very strong upon this space of the ground; she then makes several long leaps in a side direction, and thereby renders it difficult for the hounds to recover the scent. By this means the hounds are often put at fault, and the hare enabled to get considerably a-head of them.—ED.

The soil and climate have their influence upon this animal, as well as on most others. In the countries bordering on the north pole, they become white in winter, and are often seen in great troops of four or five hundred, running along the banks of the Irtish, or the Jenisca, and are as white as the snow they tread on. They are caught in toils for the sake of their skins, which, on the spot, are sold for less than seven shillings a hundred. Their fur is well known to form a considerable article in the hat manufacture; and we accordingly import vast quantities of it from those countries where the hare abounds in such plenty. They are found also entirely black, but these in much less quantities than the former;[7] and even some have been seen with horns, though these but rarely.[8]

The hares of the hot countries, particularly in Italy, Spain, and Barbary, are smaller than ours: those bred in the Milanese country are said to be the best in Europe.[9] There is scarcely a country where this animal is not to be found, from the torrid zone to the neighbourhood of the polar circle. The natives of Guinea knock them on the head as they come down to the sides of the rivers to drink. They also surround the place where they are seen in numbers, and clattering a short stick, which every man carries, against that which the person next him carries, they diminish their circle gradually, till the hares are cooped up in the midst. They then altogether throw their sticks in among them, and with such deadly force, that they seldom fail of killing great numbers at a time.[10]

The flesh of this animal has been esteemed as a delicacy among some nations, and it is held in detestation by others. The Jews, the ancient Britons, and the Mahometans, all considered it as an unclean animal, and religiously abstained from it. On the contrary, there are scarce any other people, however barbarous at present, that do not consider it as the most agreeable food. Fashion seems to preside and govern all the senses; what mankind at once considered as beautiful, fragrant, or savoury, may at another time, or among other nations, be regarded as deformed, disgustful, or ill-tasted. That flesh which the ancient Romans so much admired as to call it the food of the wise, was, among the Jews and the Druids, thought unfit to be eaten; and even the moderns, who, like the Romans, consider the flesh of this animal as a delicacy, have very different ideas as to dressing it. With us it is simply served up without much seasoning; but Apicius shows us the manner of dressing a hare in true Roman taste, with parsley, rice, vinegar, cummin seed, and coriander.[11]

THE RABBIT.

The hare and the rabbit, though so very nearly resembling each other in form and disposition, are yet distinct kinds, as they refuse to mix with each other. Mr. Buffon bred up several of both kinds in the same place; but from being at first indifferent, they soon became enemies; and their combats were generally continued until one of them was disabled or destroyed. However, though these experiments were not attended with success, I am assured that nothing is more frequent than an animal bred between these two, but which, like the mule, is marked with sterility. Nay, it has been actually known that the rabbit couples with animals of a much more distant nature; and there is at present in the Museum at Brussels, a creature covered with feathers and hair, and said to be bred between a rabbit and a hen. The fecundity of the rabbit is still greater than that of the hare; and if we should calculate the produce from a single pair in one year, the number would be amazing. They breed seven times in a year, and bring eight young ones each time. On a supposition, therefore, that this happens regularly, at the end of four years a couple of rabbits shall see a progeny of almost a million and a half. From hence we must justly apprehend being overstocked by their increase; but, happily for mankind, their enemies are numerous, and their nature inoffensive; so that their destruction bears a near proportion to their fertility.

But although their numbers be diminished by every beast and bird of prey, and still more by man himself, yet there is no danger of their extirpation. The hare is a poor defenceless animal, that has nothing but its swiftness to depend on for safety; its numbers are, therefore, every day decreasing; and in countries that are well peopled, the species are so much kept under, that laws are made for their preservation. Still, however, it is most likely that they will be at last totally destroyed; and, like the wolf or the elk in some countries, be only kept in remembrance. But it is otherwise with the rabbit, its fecundity being greater, and its means of safety more certain. The hare seems to have more various arts and instincts to escape its pursuers, by doubling, squatting, and winding; the rabbit has but one art of defence alone, but in that one finds safety, by making itself a hole, where it continues a great part of the day, and breeds up its young; there it continues secure from the fox, the hound, the kite, and every other enemy.

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[7] Klein, Disp. Quadrup. p. 52.

[8] Johnston de Quadrup. l. ii. c. 2.

[9] Dictionaire Raisonnée Lievre.

[10] Hist. Gen. des Voyages, tom. iv. p. 171.

[11] Vid. Apicii, &c.

Nevertheless, though this retreat be safe and convenient, the rabbit does not seem to be naturally fond of keeping there. It loves the sunny field and the open pasture; it seems to be a chilly animal, and dislikes the coldness of its under-ground habitation. It is, therefore, continually out, when it does not fear disturbance; and the female often brings forth her young at a distance from the warren, in a hole, not above a foot deep at the most. There she suckles them for about a month, covering them over with moss and grass, whenever she goes to pasture, and scratching them up at her return. It has been said, indeed, that this shallow hole without the warren is made lest the male should attack and destroy her young; but I have seen the male himself attend the young there, lead them out to feed, and conduct them back upon the return of the dam. This external retreat seems a kind of country-house, at a distance from the general habitation; it is usually made near some spot of excellent pasture, or in the midst of a field of sprouting corn. To this both male and female often retire from the warren, lead their young by night to the food which lies so convenient, and, if not disturbed, continue there till they are grown up. There they find a greater variety of pasture than near the warren, which is generally eaten bare; and enjoy a warmer sun, by covering themselves up in a shallower hole. Whenever they are disturbed, they then forsake their retreat of pleasure for one of safety; they fly to the warren with their utmost speed; and if the way be short, there is scarcely any dog, how swift soever, that can overtake them.

But it does not always happen that these animals are possessed of one of these external apartments; they most usually bring forth their young in the warren, but always in a hole, separate from the male. On these occasions, the female digs herself a hole,[12] different from the ordinary one, by being more intricate; at the bottom of which she makes a more ample apartment. This done, she pulls off from her belly a good quantity of her hair, with which she makes a kind of bed for her young. During the two first days she never leaves them; and does not stir out but to procure nourishment, which she takes with the utmost despatch; in this manner suckling her young, for near six weeks, until they are strong, and able to go abroad themselves. During all this time, the male seldom visits their separate apartment; but when they are grown up, so as to come to the mouth of the hole, he then seems to acknowledge them as his offspring, takes them between his paws, smooths their skin, and licks their eyes; all of them, one after the other, have an equal share in his caresses.

In this manner the rabbit, when wild, consults its pleasure and its safety; but those that are bred up tame, do not take the trouble of digging a hole, conscious of being already protected. It has also been observed,[13] that when people, to make a warren, stock it with tame rabbits, these animals, having been unaccustomed to the art of scraping a hole, continue exposed to the weather, and every other accident, without ever burrowing. Their immediate offspring also are equally regardless of their safety; and it is not till after two or three generations, that these animals begin to find the necessity and convenience of an asylum, and practise an art which they could only learn from nature.

Rabbits of the domestic breed, like all other animals that are under the protection of man, are of various colours; white, brown, black, and mouse-colour. The black are the most scarce; the brown, white, and mouse-colour, are in greater plenty. Most of the wild rabbits are of a brown, and it is the colour which prevails among the species; for, in every nest of rabbits, whether the parents be black or white, there are some brown ones found of the number. But, in England, there are many warrens stocked with the mouse-colour kinds, which some say came originally from an island in the river Humber, and which still continue their original colour, after a great number of successive generations. A gentleman,[14] who bred up tame rabbits for his amusement, gives the following account of their production: "I began," says he, "by having but one male and female only; the male was entirely white, and the female brown; but, in their posterity, the number of the brown by far exceeded those of any other colour: there were some white, some parti-coloured, and some black. It is surprising how much the descendants were obedient and submissive to their common parent; he was easily distinguished from the rest by his superior whiteness; and, however numerous the other males were, this kept them all in subjection. Whenever they quarrelled among each other, either for their females or provisions, as soon as he heard the noise, he ran up to them with all despatch, and, upon his appearance, all was instantly reduced to peace and order. If he caught any of them in the fact, he instantly punished them, as an example to the rest. Another instance of his superiority was, that having accustomed them to come to me with the call of a whistle, the instant this signal was given I saw him marshalling them up, leading them the foremost, and then suffering them all to file off before him."

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[12] Buffon.

[13] Buffon.

[14] Mr. Moutier, as quoted by Mr. Buffon

The rabbit,[15] though less than the hare, generally lives longer. As these animals pass the greater part of their lives in their burrow, where they continue at ease and unmolested, they have nothing to prevent the regularity of their health, or the due course of their nourishment. They are, therefore, generally found fatter than the hare; but their flesh is, notwithstanding, much less delicate. That of the old ones, in particular, is hard, tough, and dry; but it is said, that in warmer countries they are better tasted. This may very well be, as the rabbit, though so very plentiful in Great Britain and Ireland, is nevertheless a native of the warmer climates; and has been originally imported into these kingdoms from Spain. In that country, and in some of the islands in the Mediterranean, we are told that they once multiplied in such numbers as to prove the greatest nuisance to the natives. They at first demanded military aid to destroy them; but soon after they called in the assistance of ferrets, which originally came from Africa, and these, with much more ease and expedition, contrived to lessen the calamity. In fact, rabbits are found to love a warm climate, and to be incapable of bearing the cold of the north; so that in Sweden they are obliged to be littered in the houses. It is otherwise in all the tropical climates, where they are extremely common, and where they seldom burrow, as with us. The English counties that are most noted for these animals, are Lincolnshire, Norfolk, and Cambridgeshire. They delight in grounds of a sandy soil, which are warmer than those of clay; and which also furnish a softer and finer pasture.

The tame rabbits are larger than the wild ones, from their taking more nourishment, and using less exercise; but their flesh is not so good, being more insipid and softer. In order to improve it, they are chiefly fed upon bran, and are stinted in their water; for if indulged in too great a plenty with moist food, they are apt, as the feeders express it, to grow rotten. The hair or fur is a very useful commodity, and is employed in England for several purposes, as well when the skin is dressed with it on, as when it is pulled off. The skins, especially the white, are used for lining clothes, and are considered as a cheap imitation of ermine. The skin of the male is usually preferred, as being the most lasting, but it is coarser; that on the belly, in either sex, is the best and finest. But the chief use made of the rabbit's fur is in the manufacture of hats; it is always mixed, in certain proportions, with the fur of the beaver; and it is said to give the latter more strength and consistence.

The Syrian rabbit, like all other animals bred in that country, is remarkable for the length of its hair; it falls along the sides in wavy wreaths, and is in some places curled at the end, like wool; it is shed once a-year in large masses; and it often happens that the rabbit, dragging a part of its robe on the ground, appears as if it had got another leg, or a longer tail. There are no rabbits naturally in America; however those that have been carried from Europe, are found to multiply in the West India islands in great abundance. In other parts of that continent, they have animals that in some measure resemble the rabbits of Europe; and which most European travellers have often called *hares* or *rabbits*, as they happened to be large or small. Their giving them even the name will be a sufficient excuse for my placing them among animals of the hare kind; although they may differ in many of the most essential particulars. But before we go to the new continent, we will first examine such as bear even a distant resemblance to the hare kind at home.

THE SQUIRREL.[16]

There are few readers that are not as well acquainted with the figure of a squirrel as that of the rabbit; but supposing it unknown to any, we might give them some idea of its form, by comparing it to a rabbit, with shorter ears, and a longer tail. The tail, indeed, is alone sufficient to distinguish it from all others, as it is extremely long, beautiful, and bushy, spreading like a fan, and which, when thrown up behind, covers the whole body. This serves the little animal for a double purpose; when erected, it serves, like an umbrella, as a secure protection from the injuries of the heat and cold; and when extended, it is very instrumental in promoting those vast leaps that the squirrel takes from tree to tree; nay, some assert that it answers still a third purpose, and when the squirrel takes the water, which it sometimes does upon a piece of bark, that its tail serves it instead of a sail.[17]

There are few wild animals in which there are so many varieties as in the squirrel. The *common squirrel* is of the size of a small rabbit, and is rather of a more reddish brown. The belly and breast are white; and the ears beautifully ornamented with long tufts of hair, of a deeper colour than that on the body. The eyes are large, black, and lively; the legs are short and muscular, like those of the rabbit; but the toes longer, and the claws sharper, so as to fit it for climbing. When it eats, or dresses itself, it sits erect, like the hare or rabbit, making use of its fore-legs as hands; and chiefly resides in trees. The *gray Virginian squirrel*, which Mr. Buffon calls the *petit gris*, is larger than a rabbit, and of a grayish colour. Its body and limbs are thicker than those of the common squirrel; and its ears are shorter, and without tufts at the point. The upper part of the body, and external part of the legs, are of a fine whitish gray, with a beautiful red streak on each side lengthways. The tail is covered with very long gray hair, variegated with black and white towards the extremity. This variety seems to be common to both continents; and in Sweden is seen to change colour in winter. The *Barbary squirrel*, of which Mr. Buffon makes three varieties, is of a mixed colour, between red and black. Along the sides there are white and brown lines, which render this animal very beautiful; but what still adds to its elegance is, that the belly is of a sky blue, surrounded with white. Some of these hold up their tail erect; and others throw it forward over their body. The *Siberian white squirrel* is of the size of a common squirrel. The *Carolina black squirrel* is much bigger than the former, and sometimes tipped with white at all the extremities. The *Brasilian squirrel*, which Mr. Buffon calls the *coquallin*, is a beautiful animal of this kind, and very remarkable for the variety of its colours. Its belly is of a bright yellow; its head and body variegated with white, black, brown, and orange colour. It wants the tufts at the extremity of its ears; and does not climb trees, as most of the kind are seen to do. To this list may be added the *little ground squirrel of Carolina*, of a reddish colour, and blackish stripes on each side; and, like the former, not delighting in trees. Lastly, the *squirrel of New Spain*, which is of a deep iron-gray colour, with seven longitudinal whitish streaks along the sides of the male, and five along those of the female. As for the flying squirrels, they are a distinct kind, and shall be treated of by themselves.

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[15] Mr. Moutier, as quoted by Mr. Buffon.

[16] This elegant tribe of quadrupeds have two front teeth in each jaw; these in the upper jaw being wedge-shaped, those in the lower pointed: on each side in the upper jaw there are five grinders, and four in the lower: they have perfect collar-bones, and in most species the tail is shed on each side.—Ed

[17] Klein. Linnæus.

These, which I suppose to be but a few of the numerous varieties of the squirrel, sufficiently serve to show how extensively this animal is diffused over all parts of the world. It is not to be supposed, however, that every variety is capable of sustaining every climate; for few animals are so tender, or so little able to endure a change of abode, as this. Those bred in the tropical climates, will only live near a warm sun; while, on the contrary, the squirrel of Siberia will scarce endure the temperature of ours. These varieties do not only differ in their constitutions and colour, but in their dispositions also; for while some live on the tops of trees, others feed, like rabbits, on vegetables below. Whether any of these, so variously coloured, and so differently disposed, would breed among each other, we cannot tell: and since, therefore, we are left in uncertainty upon this point, we are at liberty either to consider each as a distinct species by itself, or only a variety, that accident might have originally produced, and that the climate or soil might have continued. For my own part, as the original character of the squirrel is so strongly marked upon them all, I cannot help considering them in the latter point of view; rather as the common descendants of one parent, than originally formed with such distinct similitudes.

The squirrel is a beautiful little animal,[18] which is but half savage; and which, from the gentleness and innocence of its manners, deserves our protection. It is neither carnivorous nor hurtful: its usual food is fruits, nuts, and acorns; it is cleanly, nimble, active, and industrious; its eyes are sparkling, and its physiognomy marked with meaning. It generally, like the hare and rabbit, sits up on its hinder legs, and uses the fore-paws as hands; these have five *claws* or *toes*, as they are called, and one of them is separated from the rest like a thumb. This animal seems to approach the nature of birds, from its lightness, and surprising agility on the tops of trees. It seldom descends to the ground, except in case of storms, but jumps from one branch to another; feeds, in spring, on the buds and young shoots; in summer, on the ripening fruits, and particularly the young cones of the pine-tree. In autumn it has an extensive variety to feast upon; the acorn, the filbert, the chestnut, and the wilding. This season of plenty, however, is not spent in idle enjoyment; the provident little animal gathers at that time its provisions for the winter; and cautiously foresees the season when the forest shall be stripped of its leaves and fruitage.

Its nest is generally formed among the large branches of a great tree, where they begin to fork off into small ones. After choosing the place where the timber begins to decay, and a hollow may the more easily be formed, the squirrel begins by making a kind of level between the forks; and then bringing moss, twigs, and dry leaves, it binds them together with great art, so as to resist the most violent storm. This is covered up on all sides; and has but a single opening at top, which is just large enough to admit the little animal; and this opening is itself defended from the weather by a kind of canopy, made in the fashion of a cone, so that it throws off the rain, though never so heavy. The nest thus formed, with a very little opening above, is, nevertheless, very commodious and roomy below: soft, well knit together, and every way convenient and warm. In this retreat the little animal brings forth its young, shelters itself from the scorching heat of the sun, which it seems to fear, and from the storms and inclemency of winter, which it is still less capable of supporting. Its

[18] Buffon.

provision of nuts and acorns is seldom in its nest, but in the hollows of the tree, laid up carefully together, and never touched but in cases of necessity. Thus one single tree serves for a retreat and a storehouse; and without leaving it during the winter, the squirrel possesses all those enjoyments that its nature is capable of receiving. But it sometimes happens that its little mansion is attacked by a deadly and powerful foe. The marten goes often in quest of a retreat for its young, which it is incapable of making for itself; for this reason it fixes upon the nest of a squirrel, and, with double injustice, destroys the tenant, and then takes possession of the mansion.

However, this is a calamity that but seldom happens: and, of all other animals, the squirrel leads the most frolicsome playful life, being surrounded with abundance, and having few enemies to fear. They are in heat early in spring; when, as a modern naturalist says,[19] it is very diverting to see the female feigning an escape from the pursuit of two or three males, and to observe the various proofs which they give of their agility, which is then exerted in full force. Nature seems to have been particular in her formation of these animals for propagation: however, they seldom bring forth above four or five young at a time; and that but once a-year. The time of their gestation seems to be about six weeks; they are pregnant in the beginning of April, and bring forth about the middle of May.

The squirrel is never found in the open fields, nor yet in copses or underwoods: it always keeps in the midst of the tallest trees, and, as much as possible, shuns the habitations of men. It is extremely watchful; if the tree in which it resides be but touched at the bottom, the squirrel instantly takes the alarm, quits its nest, at once flies off to another tree, and thus travels, with great ease, along the tops of the forest, until it finds itself perfectly out of danger. In this manner it continues for some hours at a distance from home, until the alarm be past away; and then it returns, by paths that to all quadrupeds but itself are utterly impassable. Its usual way of moving is by bounds; these it takes from one tree to another, at forty feet distance; and if at any time it is obliged to descend, it runs up the side of the next tree with amazing facility. It has an extremely sharp piercing note, which most usually expresses pain; it has another more like the purring of a cat, which it employs when pleased; at least it appeared so in that from whence I have taken a part of this description.

In Lapland, and the extensive forests to the north, the squirrels are observed to change their habitation, and to remove in vast numbers from one country to another. In these migrations they are generally seen by thousands, travelling directly forward; while neither rocks, forests, nor even the broadest waters, can stop their progress. What I am going to relate appears so extraordinary, that were it not attested by numbers of the most credible historians, among whom are Klein and Linnæus, it might be rejected, with that scorn with which we treat imposture or credulity: however, nothing can be more true than that when these animals, in their progress, meet with broad rivers, or extensive lakes, which abound in Lapland, they take a very extraordinary method of crossing them. Upon approaching the banks, and perceiving the breadth of the water, they return, as if by common consent, into the neighbouring forest, each in quest of a piece of bark, which answers all the purposes of boats for wafting them over. When the whole company are fitted in this manner, they boldly commit their little fleet to the waves; every squirrel sitting on its own piece of bark, and fanning the air with its tail, to drive the vessel to its desired port. In this orderly manner they set forward, and often cross lakes several miles broad. But it too often happens that the poor mariners are not aware of the dangers of their navigation; for although at the edge of the water it is generally calm, in the midst it is always more turbulent. There the slightest additional gust of wind oversets the little sailor and his vessel together. The whole navy, that but a few minutes before rode proudly and securely along, is now overturned, and a shipwreck of two or three thousand sail ensues. This, which is so unfortunate for the little animal, is generally the most lucky accident in the world for the Laplander on the shore; who gathers up the dead bodies as they are thrown in by the waves, eats the flesh, and sells the skins for about a shilling the dozen.[20]

The squirrel is easily tamed, and it is then a very familiar animal. It loves to lie warm, and will often creep into a man's pocket, or his bosom. It is usually kept in a box and fed with hazel nuts. Some find amusement in observing with what ease it bites the nut open, and eats the kernel. In short, it is a pleasing pretty little domestic; and its tricks and habitudes may serve to entertain a mind unequal to stronger operations.[21]

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[19] British Zoology.

[20] Œuvres de Regnard.

[21] "The barbarous practice of 'spinning a cockchafer,' provided the tail of the insect be callous, and itself void of fear, during the operation, is not a more exquisite refinement in the art of tormenting than to confine a poor squirrel in a revolving cage. If there be one method more efficacious than another to deprive it of liberty, it is this very contrivance, whereby he is constituted the centre of a system;—a governor of Barataria, where, do what he will, he never can possibly be in a state of rest,—where, let him vary never so little, even for a moment, from his centrical position, everything begins tumbling about his ears. I have many times observed with pity the panting sides of an unfortunate little animal, its state of anxious tremor in its hall of torment,—its breath exhausted by galloping, kicking, and straining—worried and alarmed, without enjoying a single inch of progressive motion, or one refreshing change of attitude, for minutes together, within his tantaliz-

ever it finds an opportunity. It does not seem fond of nuts or almonds, like other squirrels, but is chiefly pleased with the sprouts of the birch, and the cones of the pine. It is fed in its tame state with bread and fruits; it generally sleeps by day, and is always most active by night. Some naturalists gravely caution us not to let it get among our corn-fields, where, they tell us, it will do a great deal of damage, by cropping the corn as soon as it begins to ear![23]

THE MARMOUT.

FROM the description of the squirrel and its varieties, we proceed to a different tribe of animals, no way indeed resembling the squirrel, but still something like the rabbit and the hare. We are to keep these two animals still in view as the centre of our comparison; as objects to which many others may bear some similitude, though they but little approach each other.[24] Among the hare kind is the marmout, which naturalists have placed either among the hare kind or the rat kind, as it suited their respective systems. In fact, it bears no great resemblance to either; but of the two it approaches nearer the hare, as well in the make of its head as in its size, in its bushy tail, and particularly in its chewing the cud, which alone is sufficient to determine our choice in giving it its present situation. How it ever came to be degraded into the rat or mouse I cannot conceive, for it no way resembles them in size, being nearly as big as a hare; or in its disposition, since no animal is more tractable, nor more easily tamed.

The marmout is, as was said, almost as big as a hare, but it is more corpulent than a cat, and has shorter legs. Its head pretty nearly resembles that of a hare, except that its ears are much shorter. It is clothed all over with very long hair, and a shorter fur below. These are of different colours, black and gray. The length of the hair gives the body the appearance of greater corpulence than it really has, and at the same time shortens the feet, so that its belly seems touching the ground. Its tail is tufted and well furnished with hair, and it is carried in a straight direction with its body. It has five claws behind, and only four before. These it uses as the squirrel does, to carry its food to its mouth; and it usually sits upon its hinder parts to feed, in the manner of that little animal.

The marmout is chiefly a native of the Alps; and when taken young is tamed more easily than any other wild animal, and almost as perfectly as any of those that are domestic.[25] It is readily taught to dance, to wield a cudgel, and to obey the voice of its master. Like the cat, it has an antipathy to the dog; and when it becomes familiar to the family, and is sure of being supported by its master, it attacks and bites even the largest mastiff. From its squat muscular make, it has great strength joined to great agility. It has four large cutting teeth, like all those of the hare kind, but it uses them to much more advantage, since in this animal they are very formidable weapons of defence. However, it is in general a very inoffensive animal; and, except its enmity to dogs, seems to live in friendship with every creature, unless when provoked. If not prevented, it is very apt to gnaw the furniture of a house, and even to make holes through wooden partitions; from whence, perhaps, it has been compared to the rat. As its legs are very short, and made somewhat like those of a bear, it is often seen sitting up, and even walking on its hind-legs in like manner; but with the fore-paws, as was said, it uses to feed itself in the manner of a squirrel. Like all of the hare kind, it runs much swifter up hill than down; it climbs trees with great ease, and runs up the clefts of rocks or the contiguous walls of houses with great facility. It is ludicrously said that the Savoyards, who are the only chimney-sweepers of Paris, have learned this art from the marmout, which is bred in the same country.

These animals eat indiscriminately of whatever is presented to them; flesh, bread, fruits, herbs, roots, pulse, and insects. But they are particularly fond of milk and butter. Although less inclined to petty thefts than the cat, yet they always try to steal into the dairy, where they lap up the milk like a cat, purring all the while like that animal, as an expression of their being pleased. As to the rest, milk is the only liquor they like. They seldom drink water, and refuse wine. When pleased or caressed, they often yelp like puppies; but when irritated or frighted, they have a piercing note that hurts the ear. They are very cleanly animals, and like the cat retire upon necessary occasions; but their bodies have a disagreeable scent, particularly in the heat of summer. This tinctures their flesh, which being very fat and firm, would be very good, were not this flavour always found to predominate.

We have hitherto been describing affections in this animal which it has in common with many others; but we now come to one which particularly distinguishes it from all others of this kind, and indeed, from every other quadruped, except the bat and the dormouse; this is its sleeping during the winter. The marmout, though a native of the highest mountains, and where the snow is never wholly melted, nevertheless seems to feel the influence of the cold more than any other, and in a manner has all its faculties chilled up in winter. This extraordinary suspension of life and motion for more than half the year, deserves our wonder, and excites our attention to consider the manner of such a temporary death, and the subsequent revival. But first to describe, before we attempt to discuss.

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[23] He may easily be made tame: but he is apt to do a great deal of damage in the corn-fields, because he will crop the corn as soon as it begins to ear.—*Brooke's Nat. Hist.*

[24] There are eleven species of this animal, the most curious of which is the Lapland marmout or leming, for which see an account in a succeeding page under the head *leming*.—ED.

[25] Buffon, from whence the remainder of this description is taken. N. B. He takes it from Gesner, vol. xvii.

The marmout, usually at the end of September, or the beginning of October, prepares to fit up its habitation for the winter, from which it is never seen to issue till about the beginning or the middle of April. This animal's little retreat is made with great precaution, and fitted up with art. It is a hole on the side of a mountain, extremely deep, with a spacious apartment at the bottom, which is rather longer than it is broad. In this several marmouts can reside at the same time, without crowding each other, or injuring the air they breathe. The feet and claws of this animal seem made for digging; and, in fact, they burrow into the ground with amazing facility, scraping up the earth like a rabbit, and throwing back what they have thus loosened behind them. But the form of their hole is still more wonderful; it resembles the letter Y; the two branches being two openings, which conduct into one channel, which terminates in their general apartment that lies at the bottom. As the hole is made on the declivity of a mountain, there is no part of it on a level but the apartment at the end. One of the branches or openings issues out sloping downwards; and this serves as a kind of sink or drain to the whole family, where they make their excrements, and where the moisture of the place is drawn away. The other branch, on the contrary, slopes upwards, and this serves as their door, upon which to go out and in. The apartment at the end is very warmly stuccoed round with moss and hay, of both which they make an ample provision during the summer. As this is a work of great labour, so it is undertaken in common; some cut the finest grass, others gather it, and others take their turns to drag it into their hole. Upon this occasion, as we are told, one of them lies on its back, permits the hay to be heaped on its belly, keeps its paws upright to make greater room; and in this manner, lying still upon its back, it is dragged by the tail, hay and all, to their common retreat. This also some give as a reason for the hair being generally worn away on their backs, as is usually the case; however, a better reason for this may be assigned, from their continually rooting up holes, and passing through narrow openings. But be this as it will, certain it is that they all live together, and work in common to make their habitation as snug and convenient as possible. In it they pass three parts of their lives; into it they retire when the storm is high; in it they continue while it rains; there they remain when apprehensive of danger, and never stir out except in fine weather, never going far from home even then. Whenever they venture abroad, one is placed as a sentinel, sitting upon a lofty rock, while the rest amuse themselves in playing along green fields, or are employed in cutting the grass and making hay for their winter's convenience. Their trusty sentinel, when an enemy, a man, a dog, or a bird of prey approaches, apprizes its companions with a whistle, upon which they all make home, the sentinel himself bringing up the rear.

But it must not be supposed that this hay is designed for provision; on the contrary, it is always found in as great plenty in their holes at the end as at the beginning of winter; it is only sought for the convenience of their lodging, and the advantages of their young. As to provision they seem kindly apprized by Nature that during the winter they shall not want any, so that they make no preparations for food, though so diligently employed in fitting up their abode. As soon as they perceive the first approaches of the winter, during which their vital motions are to continue in some measure suspended, they labour very diligently to close up the two entrances of their habitation, which they effect with such solidity, that it is easier to dig up the earth anywhere else than where they have closed it. At that time they are very fat, and some of them are found to weigh above twenty pounds; they continue so for even three months more; but by degrees their flesh begins to waste, and they are usually very lean by the end of winter. When their retreat is opened, the whole family is then discovered, each rolled into a ball, and covered up under hay. In this state they seem entirely lifeless; they may be taken away, and even killed without their testifying any great pain; and those who find them in this manner, carry them home, in order to breed up the young and eat the old ones. A gradual and gentle warmth revives them; but they would die if too suddenly brought near the fire, or if their juices were too quickly liquefied.

Strictly speaking, says Mr. Buffon, these animals cannot be said to sleep during the winter: it may be called rather a torpor, a stagnation of all the faculties.[26] This torpor is produced by the congelation of their blood, which is naturally much colder than that of all other quadrupeds. The usual heat of man, and other animals, is about thirty degrees above congelation; the heat of these is not above ten degrees. Their internal heat is seldom greater than that of the temperature of the air. This has been often tried by plunging the ball of the thermometer into the body of a living dormouse, and it never rose beyond its usual pitch in air, and sometimes it sunk above a degree. It is not surprising, therefore, that these animals, whose blood is so cold naturally, should become torpid, when the external

[26] Buffon, vol. xvi. *Loirs.*

cold is too powerful for the small quantity of heat in their bodies yet remaining; and this always happens when the thermometer is not more than ten degrees above congelation. This coldness Mr. Buffon has experienced in the blood of the bat, the dormouse, and the hedgehog, and with great justice he extends the analogy to the marmout, which, like the rest, is seen to sleep all the winter. This torpid state continues as long as the cause which produces it continues; and it is very probable that it might be lengthened out beyond its usual term, by artificially prolonging the cold: if, for instance, the animal were rolled up in wool, and placed in a cold cellar, nearly approaching to, but not quite so cold as an ice-house, for that would kill them outright, it would perhaps remain a whole year in its state of insensibility. However this be, if the heat of the air be above ten degrees, these animals are seen to revive; and if it be continued in that degree of temperature, they do not become torpid, but eat and sleep at proper intervals, like all other quadrupeds whatever.

From the above account we may form some conception of the state in which these animals continue during the winter. As in some disorders, where the circulation is extremely languid, the appetite is diminished in proportion, so in these the blood scarcely moving, or only moving, in the greater vessels, they want no nourishment to repair what is worn away by its motions. They are seen, indeed, by slow degrees to become leaner in proportion to the slow attrition of their fluids; but this is not perceptible, except at the end of some months. Man is often known to gather nourishment from the ambient air; and these also may, in some measure, be supplied in the same manner; and having sufficient motion in their fluids to keep them from putrefaction, and just sufficient nourishment to supply the waste of their languid circulation, they continue rather feebly alive than sleeping.

These animals produce but once a-year, and usually bring forth but three or four at a time. They grow very fast, and the extent of their lives is not above nine or ten years; so that the species is neither numerous nor very much diffused. They are chiefly found in the Alps, where they seem to prefer the brow of the highest mountains to the lowest ranges, and the sunny side to that in the shade. The inhabitants of the country where they chiefly reside, when they observe the hole, generally stay till winter before they think proper to open it; for if they begin too soon, the animal wakes, and as it has a peculiar faculty of digging, makes its hole deeper in proportion as they follow. Such as kill it for food use every art to improve the flesh, which is said to have a wild taste, and to cause vomitings.[27] They, therefore, take away the fat, which is in great abundance, and salt the remainder, drying it somewhat in the manner of bacon. Still, however, it is said to be very indifferent eating. This animal is found in Poland under the denomination of the *Bobak*, entirely resembling that of the Alps, except that the latter has a toe more upon its fore-foot than the former. It is found also in Siberia under the name of the *Jevrazka*, being rather smaller than either of the other two. Lastly, it is found in Canada by the appellation of the *Monax*, differing only from the rest in having a bluish snout, and a longer tail.

THE AGOUTI.

From the marmout, which differs from the hare so much in the length of its fur, we go to the agouti, another species equally differing in the shortness of its hair.[28] These bear some rude resemblance to the hare and the rabbit in their form and manner of living, but sufficiently differing to require a particular description. The first of these, and that the largest, as was hinted above, is called the *agouti*. This animal is found in great abundance in the southern parts of America, and has by some been called the *rabbit* of that continent. But, though in many respects it resembles the rabbit, yet still in many more it differs, and is, without all doubt, an animal peculiar to the new world only. The agouti is about the size of a rabbit, and has a head very much resembling it, except that the ears are very short in comparison. It resembles the rabbit also in the arched form of its back, in the hind legs being longer than the fore, and in having four great cutting-teeth, two above and two below; but then it differs in the nature of its hair, which is not soft and downy as in the rabbit, but hard and bristly like that of a sucking-pig, and of a reddish brown colour. It differs also in the tail, which is even shorter than in the rabbit, and entirely destitute of hair. Lastly, it differs in the number of its toes, having but three on the hinder feet, whereas the rabbit has five. All these distinctions, however, do not countervail against its general form, which resembles that of a rabbit, and most travellers have called it by that name.

As this animal differs in form, it differs still more in habitudes and disposition. As it has the hair of a hog, so also it has its voraciousness.[29] It eats indiscriminately of all things and, when satiated, hides the remainder, like the dog or the fox, for a future occasion. It takes a pleasure in gnawing and spoiling every thing it comes near. When irritated, its hair stands erect along the back, and, like the rabbit, it strikes the ground violently with its hind feet. It does not dig a hole in the ground, but burrows in the hollows of trees. Its ordinary food consists of the roots of the country, potatoes, and yams, and such fruits as fall from the trees in autumn. It uses its fore-paws, like the squirrel, to carry its food to its mouth: and as his hind feet are longer than the fore, it runs very swiftly upon plain ground or up a hill, but upon a descent it is in danger of falling. Its sight is excellent, and its hearing equals that of any other animal; whenever it is whistled to, it stops to hearken. The flesh of such as are fat and well fed is tolerable food, although it has a peculiar taste, and is a little tough. The French dress it like a sucking-pig, as we learn from Mr. Buffon's account; but the English dress it with a pudding in its belly like a hare. It is hunted by dogs; and whenever it has got into a sugar-ground, where the canes cover the place, it is easily overtaken, for it is embarrassed every step it takes, so that a man may easily come up with it without any other assistance. When in the open country, it usually runs with great swiftness before the dogs, until it gains its retreat, within which it continues to hide, and nothing but filling the hole with smoke can force it out. For this purpose the hunter burns faggots or straw at the entrance, and conducts the smoke in such a manner that it fills the whole cavity. While this is doing, the poor little animal seems sensible of its danger, and begs for quarter with a most plaintive cry, seldom quitting its hole till the utmost extremity. At last, when half-suffocated, it issues out, and trusts once more to its speed for protection. When still forced by the dogs, and incapable of making good a retreat, it turns upon the hunters, and with its hair bristling like a hog, and standing upon its hind-feet, it defends itself very obstinately. Sometimes it bites the legs of those that attempt to take it, and will take out the piece wherever it fixes its teeth.[30]

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[27] Dictionaire Raisonnée, vol. iii. p. 29.

[28] This animal, together with the paca, apera, guinea pig, capibara, and a few other species, are now arranged under the general appellation of cavy. They are distinguished by having two wedge-shaped front teeth in each jaw, and eight grinders on each side in both jaws; they have from four to six toes on the fore-feet, and from three to five on the hinder; the tail is very short or none, and they have no collar bones. They are inhabitants of warmer regions, live entirely on vegetable substances, reside under ground or beneath the roots of trees, and move with a slow and kind of leaping pace.—Ed.

[29] Buffon.

Its cry when disturbed or provoked, resembles that of a sucking-pig. If taken young, it is easily tamed, continues to play harmlessly about the house, and goes out and returns of its own accord. In a savage state, it usually continues in the woods, and the female generally chooses the most obscure parts to bring forth her young. She there prepares a bed of leaves and dry grass, and generally brings forth two at a time. She breeds twice or thrice a-year. and carries her young from one place to another, as convenience requires, in the manner of a cat. She generally lodges them, when three days old, in the hollow of a tree, suckling them but a very short time; for they soon come to perfection, and it should consequently follow that they soon grow old.

THE PACA.

THE paca is an animal also of South America, very much resembling the former, and like it has received the name of the *American rabbit*, but with as little propriety. It is about the size of a hare, or rather larger, and in figure somewhat like a sucking-pig, which it also resembles in its grunting and in its manner of eating. It is, however, most like the agouti, although it differs in several particulars. Like the agouti, it is covered rather with coarse hair than a downy fur. But then it is beautifully marked along the sides with small ash-coloured spots, upon an amber-coloured ground; whereas the agouti is pretty much of one reddish colour. The paca is rather more thick and corpulent than the agouti; its nose is shorter, and its hind-feet have five toes; whereas the agouti has but three. As to the rest, this animal bears some distant resemblance to a rabbit, the ears are naked of hair, and somewhat sharp, the upper jaw is somewhat longer than the lower, the teeth, the shape of the head, and the size of it, are like to those of a rabbit. It has a short tail likewise though not tufted; and its hinder legs are longer than the fore. It also burrows in the ground like that animal, and from this similitude alone, travellers might have given it the name.

The paca does not make use of its fore-paws, like the squirrel or the agouti, to carry its food to the mouth, but hunts for it on the ground, and roots like a hog. It is generally seen along the banks of rivers, and is only to be found in the moist and warm countries of South America. It is a very fat animal, and in this respect much preferable to the agouti, that is most commonly found lean. It is eaten, skin and all, like a young pig, and is considered as a great delicacy. Like the former little animal, it defends itself to the last extremity, and is very seldom taken alive. It is persecuted not only by man, but by every beast and bird of prey, who all watch its motions, and, if it ventures at any distance from its hole, are sure to seize it. But although the race of these little animals is thus continually destroyed, it finds some refuge in its hole, from the general combination; and breeds in such numbers, that the diminution is not perceptible.

To these animals may be added others, very similar, both in form and disposition; each known by its particular name in its native country, but which travellers have been contented to call rabbits or hares; of which we have but indistinct notice. The TAPETI, or the BRASILIAN RABBIT, is in shape like our English ones, but is much less, being said to be not above twice the size of a dormouse. It is reddish on the forehead, and a little whitish under the throat. It is remark able for having no tail; but it has long ears, with whiskers, like our rabbits, and black eyes. It does not burrow, like ours; but lives at large, like the hare.

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[30] Ray's Synopsis.

The APEREA is called also by some the BRASILIAN RABBIT, being an animal that seems to partake of the nature of a rabbit and a rat. The ears are like those of a rat, being short and round; but the other parts are like those of a rabbit, except that it has but three toes on the hinder legs, like the agouti.

To these imperfect sketches of animals little known, others less known might be added; for as nature becomes more diminutive, her operations are less attentively regarded. I shall only, therefore, add one animal more to this class, and that very well known; I mean the Guinea-pig; which Brisson places among those of the rabbit kind; and as I do not know any other set of animals with which it can be so well compared, I will take leave to follow his example.

THE GUINEA-PIG.

The Guinea-pig is a native of the warmer climates; but has been so long rendered domestic, and so widely diffused, that it has now become common in every part of the world. There are few unacquainted with the figure of this little animal; in some places it is considered as the principal favourite; and is often found even to displace the lap-dog. It is less than a rabbit, and its legs are shorter; they are scarcely seen, except when it moves; and the neck also is so short, that the head seems stuck upon the shoulders. The ears are short, thin, and transparent; the hair is like that of a sucking-pig, from whence it has taken the name; and it wants even the vestiges of a tail. In other respects, it has some similitude to the rabbit. When it moves, its body lengthens like that animal; and when it is at rest, it gathers up in the same manner. Its nose is formed with the rabbit lip, except that its nostrils are much farther asunder. Like all other animals in a domestic state, its colours are different; some are white, some are red, and others both red and white. It differs from the rabbit in the number of it toes, having four toes on the feet before, and but three on those behind. It strokes its head with the fore-feet, like the rabbit; and, like it, sits upon the hind-feet; for which purpose there is a naked callous skin on the back part of the legs and feet.

These animals are, of all others, the most helpless and inoffensive.[31] They are scarcely possessed of courage sufficient to defend themselves against the meanest of all quadrupeds, a mouse. Their only animosity is exerted against each other: for they will often fight very obstinately; and the stronger is often known to destroy the weaker. But against all other aggressors, their only remedy is patience and non-resistance. How, therefore, these animals, in a savage state, could contrive to protect themselves I have not been able to learn; as they want strength, swiftness, and even the natural instinct so common to almost every other creature.

As to their manner of living among us, they owe their lives entirely to our unceasing protection. They must be constantly attended, shielded from the excessive colds of the winter, and secured against all other domestic animals, which are apt to attack them, from every motive, either of appetite, jealousy, or experience of their pusillanimous nature. Such, indeed, is their stupidity, that they suffer themselves to be devoured by the cats without resistance; and differing from all other creatures, the female sees her young destroyed without once attempting to protect them. Their usual food is bran, parsley, or cabbage-leaves; but there is scarce a vegetable cultivated in our gardens that they will not gladly devour. The carrot-top is a peculiar dainty, as also salad; and those who would preserve their healths, would do right to vary their food; for if they be continued on a kind too succulent or too dry, the effects are quickly perceived upon their constitution. When fed upon recent vegetables, they seldom drink. But it often happens that, conducted by nature, they seek drier food, when the former disagrees with them. They then gnaw clothes, paper, or whatever of this kind they meet with; and on these occasions they are seen to drink like most other animals, which they do by lapping. They are chiefly fond of new milk; but, in case of necessity, are content with water.

They move pretty much in the manner of rabbits, though not near so swiftly; and when confined in a room, seldom cross the floor, but generally keep along the wall. The male usually drives the female on before him, for they never move abreast together, but constantly the one seems to tread in the footsteps of the preceding. They chiefly seek for the darkest recesses, and the most intricate retreats; where, if hay be spread as a bed for them, they continue to sleep together, and seldom venture out but when they suppose all interruption removed. On these occasions they act as rabbits; they swiftly move forward from their bed, stop at the entrance, listen, look round, and if they perceive the slightest approach of danger, they run back with precipitation. In very cold weather, however, they are more active, and run about in order to keep themselves warm.

They are a very cleanly animal, and very different from that whose name they go by. If the young ones happen to fall into the dirt, or be any other way discomposed, the female takes such an aversion to them, that she never permits them to visit her more. Indeed, her whole employment, as well as that of the male, seems to consist in smoothing their skins, in disposing their hair, and improving its gloss. The male and female take this office by turns; and when they have brushed up each other, they then bestow all their concern upon their young, taking particular care to make their hair lie smooth, and biting them if they appear refractory. As they are so solicitous for elegance themselves, the place where they are kept must be regularly cleaned, and a new bed of hay provided for them at least every week. Being natives of a warm climate, they are naturally chilly in ours; cleanliness, therefore, assists warmth and expels moisture. They may be thus reared, without the aid of any artificial heat; but, in general, there is no keeping them from the fire in winter, if they be once permitted to approach it.

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[31] This history s partly taken from the Amænitates Academicæ, vol. iv. p. 202.

When they go to sleep, they lie flat on their bellies, pretty much in their usual posture; except that they love to have their fore-feet higher than their hinder. For this purpose they turn themselves several times round before they lie down, to find the most convenient situation. They sleep like the hare, with their eyes half open; and continue extremely watchful, if they suspect danger. The male and female are never seen both asleep at the same time; but while he enjoys his repose, she remains upon the watch silently continuing to guard him, and her head turned towards the place where he lies. When she supposes that he has had his turn, she then awakes him with a kind of murmuring noise, goes to him, forces him from his bed, and lies down in his place. He then performs the same good turn for her; and continues watchful till she also has done sleeping.

These animals are exceedingly salacious, and generally are capable of coupling at six weeks old. The female never goes with young above five weeks; and usually brings forth from three to five at a time; and this not without pain. But what is very extraordinary, the female admits the male the very day she has brought forth, and becomes again pregnant; so that their multiplication is astonishing. She suckles her young but about twelve or fifteen days; and during that time does not seem to know her own; for if the young of any other be brought, though much older, she never drives them away, but suffers them even to drain her, to the disadvantage of her own immediate offspring. They are produced with the eyes open, like all others of the hare kind; and in about twelve hours, equal even to the dam in agility. Although the dam has but two teats, yet she abundantly supplies them with milk; and they are also capable of feeding upon vegetables, almost from the very beginning. If the young ones are permitted to continue together, the stronger, as in all other societies, soon begin to govern the weak. Their contentions are often long and obstinate; and their jealousies very apparent. Their disputes are usually for the warmest place, or the most agreeable food. If one of them happens to be more fortunate in this respect than the rest, the strongest generally comes to dispossess it of its advantageous situation. Their manner of fighting, though terrible to them, is ridiculous enough to a spectator. One of them seizes the hair on the nape of the other's neck with its fore-teeth, and attempts to tear it away; the other to retaliate, turns its hinder parts to the enemy, and kicks up behind like a horse, and with its hinder claws scratches the sides of its adversary; so that sometimes they cover each other with blood. When they contend in this manner, they gnash their teeth pretty loudly, and this is often a denunciation of mutual resentment.

These, though so formidable to each other, yet are the most timorous creatures upon earth, with respect to the rest of animated nature: a falling leaf disturbs them, and every animal overcomes them. From hence they are difficultly tamed, and will suffer none to approach them, except the person by whom they are fed. Their manner of eating is something like that of the rabbit; and, like it, they appear also to chew the cud. Although they seldom drink, they make water every minute. They grunt somewhat like a young pig; and have a more piercing note to express pain. In a word, they do no injury; but then, except the pleasure they afford the spectator, they are of very little benefit to mankind. Some, indeed, dress and eat them; but their flesh is indifferent food, and by no means a reward for the trouble of rearing them. This, perhaps, might be improved, by keeping them in a proper warren, and not suffering them to become domestic; however, the advantages that would result from this would be few, and the trouble great; so that it is likely they will continue a useless, inoffensive dependent, rather propagated to satisfy caprice than to supply necessity.

BOOK VII.

ANIMALS OF THE RAT KIND, AND VARIOUS OTHER SPECIES.

CHAP. I.

THE RAT KIND.

Were it necessary to distinguish animals of the rat kind from all others,[1] we might describe them as having two large cutting teeth like the hare kind, in each jaw; as covered with hair; and as not ruminating. These distinctions might serve to guide us, had we not too near an acquaintance with this noxious race to be mistaken in their kind. Their numbers, their minuteness, their vicinity, their vast multiplication, all sufficiently contribute to press them upon our observation, and remind us of their existence. Indeed, if we look through the different ranks of animals, from the largest to the smallest, from the great elephant to the diminutive mouse, we shall find that we suffer greater injuries from the contemptible meanness of the one, than the formidable invasions of the other. Against the elephant, the rhinoceros, or the lion, we can oppose united strength, and by art make up the deficiencies of natural power; these we have driven into their native solitudes, and obliged to continue at a distance, in the most inconvenient regions and unhealthful climates. But it is otherwise with the little teasing race I am now describing: no force can be exerted against their unresisting timidity; no arts can diminish their amazing propagation; millions may be at once destroyed, and yet the breach be repaired in the space of a very few weeks; and in proportion as nature has denied them force, it has supplied the defect by their fecundity.

THE GREAT RAT.

The animal best known at present, and in every respect the most mischievous, is the great rat; which, though but a new comer into this country, has taken too secure a possession to be ever removed. This hateful and rapacious creature, though sometimes called the *rat of Norway*, is utterly unknown in all the northern countries, and, by the best accounts I can learn, comes originally from the Levant. Its first arrival, as I am assured, was upon the coasts of Ireland, in those ships that traded in provisions to Gibraltar; and perhaps we owe to a single pair of these animals, the numerous progeny that now infests the whole extent of the British empire.

This animal, which is called by Mr. Buffon the *surmulot*,[2] is in length about nine inches; its eyes are large and black; the colour of the head, and the whole upper part of the body, is of a light brown, mixed with a tawny and ash colour. The end of the nose, the throat and the belly, are of a dirty white, inclining to gray; the feet and legs are almost bare, and of a dirty pale flesh-colour; the tail is as long as the body, covered with minute dusky scales mixed with a few hairs, and adds to the general deformity of its detestable figure. It is chiefly in the colour that this animal differs from the *black rat*, or the *common rat*, as it was once called ; but now common no longer. This new invader, in a very few years after its arrival, found means to destroy almost the whole species, and to possess itself of their retreats.

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[1] They have the upper front teeth wedge-shaped, three grinders on each side in each jaw, though sometimes only two, and have perfect collar bones. In Turton's Linné forty-six species are described, besides varieties.—Ed.

[2] The surmulot or brown rat came from the southern regions of Asia, and its instinct has established it more completely among us than we could have ever done by our intelligence. The surmulots have found in the burrows which they have dug beneath our roofs that degree of temperature necessary to their preservation. In our cultivated fields, in our granaries, in fact in all the provision which the foresight of man has collected, they have found an aliment suitable to their life, and favourable to their reproduction. The surmulot is larger than the rat. They are sometimes found above eight or nine inches in length. The tail is about one-eighth of the body. This animal is less heavy and clumsy than the marmot or the beaver, and less light than the dormouse or squirrel. Its motions are prompt and lively, and it climbs and swims with agility. Its perseverance in labour produces effects apparently far surpassing the extent of its powers. It penetrates everywhere. It pierces walls and displaces pavements; and, as the surmulots generally unite in great numbers, when they enter a habitation, they even put the foundation of it in considerable danger. They eat animal and vegetable substances indifferently. They make use of their fore-teeth in eating, and drink much, lapping with their tongues. They bring forth many times in the year, and generally from eight to twelve at a birth. When they are annoyed in their establishments by men or animals, they remove, and sometimes emigrate to a considerable distance. Towards the middle of the sixteenth century, they were observed for the first time in the neighbourhood of Paris, and M. F. Cuvier assures us that in some of the departments of France they are yet unknown. Pallas tells us that they arrived at Astracan in the autumn of 1727, in such numbers, and in so short a time, that nothing could be done to oppose them. They came from the western desert, and traversed the waves of the Volga, which unquestionably must have swallowed up a part of their horde. They have not advanced any further to the North, and are not to be found in Siberia. The general colour of this animal is a darkish-gray fawn above, and a pale-gray below. The tail is scaly, *i. e.* covered with small parallelograms of epidermis ranged in circles around it, and underneath the extremity of each lamina of epidermis grow some small gray hairs. The hairs which cover the limbs and the head are short. The mustachios are black, and the soles of the feet, which are naked, are flesh-coloured, as are also the ears and extremity of the muzzle.—Ed.

But it was not against the black rat alone that its rapacity was directed; all other animals of inferior strength shared the same misfortunes. The contest with the black rat was of short continuance. As it was unable to contend, and had no holes to fly to for retreat, but where its voracious enemy could pursue, the whole race was soon extinguished. The frog also was an animal equally incapable of combat or defence. It had been designedly introduced into the kingdom of Ireland some years before the Norway rat; and it was seen to multiply amazingly. The inhabitants were pleased with the propagation of a harmless animal, that served to rid their fields of insects ; and even the prejudices of the people were in its favour, as they supposed that the frog contributed to render their waters more wholesome. But the Norway rat soon put a stop to their increase ; as these animals were of an amphibious nature, they pursued the frog to its lakes, and took it even in its own natural element. I am, therefore, assured, that the frog is once more almost extinct in that kingdom ; and that the Norway rat, having no more enemies left there to destroy, is grown less numerous also.

We are not likely, therefore, to gain by the destruction of our old domestics, since they are replaced by such mischievous successors. The Norway rat has the same disposition to injure us, with much greater power of mischief. It burrows in the banks of rivers, ponds, and ditches ; and is every year known to do incredible damage to those mounds that are raised to conduct streams, or to prevent rivers from overflowing. In these holes, which it forms pretty near the edge of the water, it chiefly resides during the summer, where it lives upon small animals, fish, and corn. At the approach of winter, it comes nearer the farm-houses, burrows in their corn, eats much, and damages still more than it consumes. But nothing that can be eaten seems to escape its voracity. It destroys rabbits, poultry, and all kinds of game ; and, like the polecat, kills much more than it can carry away. It swims with great ease, dives with great celerity, and easily thins the fishpond. In short, scarcely any of the feebler animals escape its rapacity, except the mouse, which shelters itself in its little hole, where the Norway rat is too big to follow.

These animals frequently produce from ten to fifteen at a time ;[3] and usually bring forth three times a-year. This great increase would quickly be found to overrun the whole country, and render our assiduity to destroy them fruitless, were it not, happily for us, that they eat and destroy each other. The same insatiable appetite that impels them to indiscriminate carnage, also incites the strongest to devour the weakest, even of their own kind. The large male rat generally keeps in a hole by itself, and is as dreaded by its own species as the most formidable enemy. In this manner the number of these vermin is kept within due bounds ; and when their increase becomes injurious to us, it is repressed by their own rapacity.

But beside their own enmities among each other, all the stronger carnivorous quadrupeds have natural antipathies against them. The dog, though he detests their flesh, yet openly declares his alacrity to pursue them ; and attacks them with great animosity. Such as are trained up to killing these vermin, despatch them often with a single squeeze ; but those dogs that show any hesitation, are sure to come off but indifferently ; for the rat always takes the advantage of a moment's delay, and, instead of waiting for the attack, becomes the aggressor, seizing its pursuer by the lip, and inflicting a very painful and dangerous wound. From the inflammation, and other angry symptoms that attend this animal's bite, some have been led to think that it was in some measure venomous ; but it is likely that the difficulty of the wound's healing arises merely from its being deep, and lacerated by the teeth, and is rather a consequence of the figure of the instruments that inflict it, than any venom they may be supposed to possess.

The cat is another formidable enemy of this kind ; and yet the generality of our cats neither care to attack it, nor to feed upon it when killed. The cat is a more prudent hunter than the dog, and will not be at the pains to take or combat with an enemy that is not likely to repay her time and danger. Some cats, however, will pursue and take the rat ; though often not without an obstinate resistance. If hungry, the cat will sometimes eat the head ; but, in general, she is content merely with her victory.

A foe much more dangerous to these vermin is the weasel. This animal pursues them with avidity, and being pretty nearly of their own size, follows them into their holes, where a desperate combat ensues. The strength of each is pretty near equal ; but the arms are very different. The rat, furnished with four long tusks at the extremity of its jaw, rather snaps than bites ; but the weasel, where it once fastens, holds, and continuing also to suck the blood at the same time, weakens its antagonist, and always obtains the victory. Mankind have contrived several other methods of destroying these noxious intruders ; ferrets, traps, and particularly poison ; but of all other poisons, I am told that the nux vomica, ground and mixed with meal, is the most certain, as it is the least dangerous.

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[3] Buffon, vol. xvii. p. 2.

To this species I will subjoin as a variety, the BLACK RAT,[4] mentioned above, greatly resembling the former in figure, but very distinct in nature, as appears from their mutual antipathy. This animal was formerly as mischievous as it was common; but at present it is almost utterly extirpated by the great rat, one malady often expelling another. It is become so scarce, that I do not remember ever to have seen one. It is said to be possessed of all the voracious and unnatural appetites of the former: though, as it is less, they may probably be less noxious. Its length is about seven inches; and the tail is near eight inches long. The colour of the body is of a deep iron-gray, bordering upon black, except the belly, which is of a dirty cinereous hue. They have propagated in America in great numbers, being originally introduced from Europe; and as they seem to keep their ground wherever they get footing, they are now become the most noxious animals in that part of the world.

To this also we may subjoin the BLACK WATER-RAT, about the same size with the latter, with a larger head, a blunter nose, less eyes, and shorter ears, and the tip of its tail a little white. It was supposed by Ray to be web-footed; but this has been found to be a mistake, its toes pretty much resembling those of its kind. It never frequents houses; but is usually found on the banks of rivers, ditches, and ponds, where it burrows and breeds. It feeds on fish, frogs, and insects; and in some countries it is eaten on fasting days.[5]

THE MOUSE.

An animal equally mischievous, and equally well known with the former, is the mouse. Timid, cautious, and active, all its dispositions are similar to those of the rat, except with fewer powers of doing mischief.[6] Fearful by nature, but familiar from necessity, it attends upon mankind, and comes an unbidden guest to his most delicate entertainments. Fear and necessity seem to regulate all its motions; it never leaves its hole but to seek provision, and seldom ventures above a few paces from home. Different from the rat, it does not go from one house to another, unless it be forced; and as it is more easily satisfied, it does much less mischief.

Almost all animals are tamed more difficultly in proportion to the cowardice of their natures. The truly bold and courageous easily become familiar, but those that are always fearful are ever suspicious. The mouse being the most feeble, and consequently the most timid of all quadrupeds, except the Guinea-pig, is never rendered thoroughly familiar; and, even though fed in a cage, retains its natural apprehensions. In fact, it is to these alone that it owes its security.[7] No animal has more enemies, and few so incapable of resistance. The owl, the cat, the snake, the hawk, the weasel, the rat itself, destroy this species by millions, and it only subsists by its amazing fecundity.

The mouse brings forth at all seasons, and several times in a year. Its usual number is from six to ten. These in less than a fortnight are strong enough to run about and shift for themselves. They are chiefly found in farmers' yards and among their corn, but are seldom in those ricks that are much infested with rats. They generally choose the south-west side of the rick from whence most rain is expected; and from thence they often, of an evening, venture forth to drink the little drops either of rain or dew that hang at the extremities of the straw.[8] Aristotle gives us an idea of their prodigious fecundity, by assuring us, that having put a mouse with young into a vessel of corn, in some time after he found a hundred and twenty mice, all sprung from one original.[9] The early growth of this animal implies also the short duration of its life, which seldom lasts above two or three years. This species is very much diffused, being found in almost all parts of the ancient continent, and having been exported to the new.[10] They are animals that, while they fear human society, closely attend it; and, although enemies to man, are never found but near those places where he has fixed his habitation. Numberless ways have been found for destroying them; and Gesner has minutely described the variety of traps by which they are taken. Our Society for the Encouragement of Arts and Manufactures proposed a reward for the most ingenious contrivance for that purpose; and I observed almost every candidate passing off descriptions as inventions of his own. I thought it was cruel to detect the plagiarism or frustrate the humble ambition of those who would be thought the inventors of a mouse-trap.

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[4] Nothing indicates any knowledge of this animal among the ancients, and the modern authors who have spoken clearly on the subject, go no farther back than the sixteenth century. Gesner is perhaps the first naturalist who has described it. Had this animal lived formerly as it does at present, among us, and at our expense, it is not probable that all mention of it would have been omitted, especially as we find notices of other animals of a similar kind, less remarkable and less destructive, such as the mouse, dormouse, &c. Some naturalists think with Linnæus and Pallas, that we have received it from America, and others believe that it is a present of our own to that country, made after we had ourselves received it from the eastern regions. To this question it is perhaps impossible to reply, and with the lights which we possess on the subject, conjecture is but a frivolous amusement. It is certain that the rat is to be found in all the warm and temperate climates of the globe, that it is wonderfully common in Persia, and multiplied to a prodigious extent in the western islands, where it is not obliged by winter to seek a refuge in the habitations of man, but where the fields during the entire year present it with abundance of nutriment. In all this part of America, accordingly, it has become a perfect scourge, from its ravages and devastations. In fact, the rat consumes an immense quantity of provision, and destroys or damages still more than it consumes, particularly in the fields, as it cuts up from the roots plants of which it eats but a portion. With us its favourite abode is in barns or granaries, under straw roofs, or in deserted houses. Sometimes it will burrow in the earth like the surmulot, or brown rat, when it can get no other habitation. Though this last-mentioned species does not mix with the common or black rat now under consideration, and even may sometimes destroy it, yet the natural antipathy commonly supposed to exist between them is an error. The surmulots do not necessarily exclude the rats from their vicinity, nay, the two species often live under the same shelter, and in contiguous burrows. This occurs when the place of their establishment affords food in abundance, and excludes the necessity of mutual warfare for subsistence. In the contrary case, we find that the surmulots not only destroy the rats, but that the latter, as is well known, will devour one another. —Ed.

[5] Dr. Shaw, in his general zoology, informs us, that a gentleman travelling through Mecklenburg about thirty years ago, was witness to the following curious circumstance in the post-house at New Stargard. After dinner the landlord placed on the floor a large dish of soup, and gave a loud whistle. Immediately then came into the room a mastiff, a fine Angora cat, an old raven, and a remarkably large rat with a bell about its neck. The four animals went to the dish, and, without disturbing each other, fed together, after which the dog, cat, and rat, lay before the fire, while the raven hopped about the room. The landlord, after accounting for the familiarity which existed among the animals, informed his guest that the rat was the most useful of the four; for the noise he made had completely freed the house from the rats and mice with which it was before infested.—Ed.

[6] Buffon, vol. xv. p. 145.

[7] E volucribus hirundines sunt indociles, e terrestribus mures.—*Plin.*

To this species, merely to avoid teasing the reader with a minute description of animals very inconsiderable and very nearly alike, I will add that of the LONG-TAILED FIELD-MOUSE, which is larger than the former, of a colour very nearly resembling the Norway rat, and chiefly found in fields and gardens. They are extremely voracious, and hurtful in gardens and young nurseries, where they are killed in great numbers. However, their fecundity quickly repairs the destruction.

Nearly resembling the former, but larger, (for it is six inches long,) is the SHORT-TAILED FIELD-MOUSE; which, as its name implies, has the tail much shorter than the former, it being not above an inch and a half long, and ending in a small tuft. Its colour is more inclining to that of the domestic mouse, the upper part being blackish, and the under of an ash colour. This, as well as the former, are remarkable for laying up provision against winter; and Mr. Buffon assures us they sometimes have a store of above a bushel at a time.[11]

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[8] Buffon, vol. xv. p. 147.

[9] "An extraordinary instance of the rapid increase of mice, and of the injury they sometimes do, occurred a few years ago in the new plantations, made by order of the Crown, in the forest of Dean, Gloucestershire, and in the New forest, Hampshire. Soon after the formation of these plantations, a sudden and rapid increase of mice took place in them, which threatened destruction to the whole of the young plants. Vast numbers of these were killed,—the mice having eaten through the root of five years old oaks and chestnuts, generally just below the surface of the ground. Hollies also, which were five and six feet high, were barked round the bottom, and in some instances the mice had crawled up the tree, and were even feeding on the bark of the upper branches. In the reports made to government on the subject, it appears that the roots had been eaten through wherever they obstructed the run of the mice, but that the bark of the trees constituted their food. This was ascertained by confining a number of the mice in cages, and supplying them with the fresh roots and bark of trees, whence it was found that they fed greedily on the latter, and left the roots untouched. Various plans were devised for their destruction; traps were set, poison laid, and cats turned out, but nothing appeared to lessen their numbers. It was at last suggested, that if holes were dug into which the mice might be enticed or fall, their destruction might be effected. Holes, therefore, were made, about twenty yards asunder, in some of the Dean forest plantations, being about twelve in each acre of ground. These holes were from eighteen to twenty inches in depth, and two feet one way, and a half the other, and they were much wider at the bottom than the top, being excavated hollow under, so that the animal, when once in, could not easily get out again. In these holes, at least 30,000 mice were caught in the course of three or four months, that number having been counted out and paid for by the proper officers of the forest. It was however calculated, that a much greater number of mice than these were taken out of the holes, after being caught, by stoats, weasels, kites, hawks and owls, and also by crows, jays, and magpies. As the mice increased, so did the birds of prey, of which at last there were an incredible number. In New forest, from the weekly reports of the deputy surveyor of the forest, about the same number were destroyed, allowing the same calculation for those eaten by vermin: and in addition to which, it should be mentioned, that these mice were found to eat each other when their food fell short in winter. Putting these circumstances together, the total destruction of mice in the two forests, would probably amount to more than 200,000."—*Jesse's Gleanings.*

[10] Lisle's Husbandry, vol. ii. p. 391.

[11] The economic campagnol, as it is called, is in length about four inches, exclusive of the tail, which measures one inch. The limbs are strong; the ears short, naked, and almost hidden beneath the fur of the head.—The general colour is tawny, somewhat whiter beneath than on the back. Economic campagnols are found in various parts of Siberia and Kamtschatka, where they make their burrows, with the utmost skill, immediately below the surface of a soft turfy soil. They form a chamber of a flattish arched form, about a foot in diameter, to which they sometimes add twenty or thirty small passages or entrances. Near the chamber they frequently construct other caverns, in which they deposit their stores or plants, which they gather in summer and bring home; and even at times they bring them out of their cells to give them a more thorough drying in the sun. They associate in pairs; and except during summer, when the male leads a solitary life in the woods, the male and female commonly sleep in the same nest. The migrations of these quadrupeds have been noticed both by Dr. Grieve and Mr. Pennant; but neither of them have attempted to explain the cause. "In the spring," says the former writer, "they assemble in amazing numbers, and proceed in a direct course westward, swimming with the utmost intrepidity over rivers, lakes, and even arms of the sea. Many are drowned, and many are destroyed by water-fowl, or rapacious fish. Those that escape

We may add also the SHREW-MOUSE to this species of minute animals, being about the size of the domestic mouse, but differing greatly from it in the form of its nose, which is very long and slender. The teeth also are of a very singular form, and twenty-eight in number; whereas the common number in the rat kind is usually not above sixteen. The two upper fore-teeth are very sharp, and on each side of them there is a kind of wing or beard, like that of an arrow, scarcely visible but on a close inspection. The other teeth are placed close together, being very small, and seeming scarcely separated; so that with respect to this part of its formation, the animal has some resemblance to the viper. However, it is a very harmless little creature, doing scarcely any injury. On the contrary, as it lives chiefly in the fields, and feeds more upon insects than corn, it may be considered rather as a friend than an enemy. It has a strong, disagreeable smell, so that the cat, when it is killed, will refuse to eat it. It is said to bring four or five young at a time.

THE DORMOUSE.

THESE animals may be distinguished into three kinds; the GREATER DORMOUSE, which Mr. Buffon calls the LOIR; the MIDDLE, which he calls the LEROT; the LESS, which he denominates the MUSCARDIN. They differ from each other in size, the largest being equal to a rat, the least being no bigger than a mouse. They all differ from the rat in having the tail tufted with hair, in the manner of a squirrel, except that the squirrel's tail is flat, resembling a fan; and theirs round, resembling a brush. The lerot differs from the loir by having two black spots near the eyes; the muscardin differs from both in the whitish colour of its hair on the back. They all three agree in having black sparkling eyes; and the whiskers partly white and partly black. They agree in their being stupified, like the marmout, during the winter, and in their hoarding up provisions to serve them in case of a temporary revival.

They inhabit the woods or very thick hedges, forming their nests in the hollow of some tree, or near the bottom of a close shrub, humbly content with continuing at the bottom, and never aspiring to sport among the branches. Towards the approach of the cold season, they form a little magazine of nuts, beans, or acorns; and having laid in their hoard, shut themselves up with it for the winter. As soon as they feel the first advances of the cold, they prepare to lessen its effect by rolling themselves up in a ball, and thus exposing the smallest surface to the weather. But it often happens that the warmth of a sunny day, or an accidental change from cold to heat, thaws their nearly stagnant fluids, and they revive. On such occasions they have their provisions laid in, and they have not far to seek for their support. In this manner they continue usually asleep, but sometimes waking, for about five months in the year, seldom venturing from their retreats, and, consequently, but rarely seen. Their nests are lined with moss, grass, and dead leaves; they usually bring forth three or four

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on emerging from the water, rest awhile to bask, dry their fur, and refresh themselves. The Kamtschadales, who have a kind of superstitious veneration for these little animals, whenever they find any of them on the banks of the rivers, weak and exhausted, render them every possible assistance. As soon as they have crossed the river Penschinska, at the head of the gulf of the same name, they turn in a south-westerly direction; and about the middle of July, generally reach the rivers Ochetska and Judoma, a distance of a thousand miles! The flocks are also so numerous, that travellers have waited about two hours for them to pass. The retirement of these animals is considered by the Kamtschadales as a serious misfortune; but their return occasions the utmost joy and festivity, a successful chase and fishery being always considered as its certain consequence." Dr. Henderson, in his 'Tour in Iceland,' has the following extraordinary statement: "There is nothing about Husafell deserving of notice except its mouse, the history of which has rendered it more famous than other parts of the island where the same zoological phenomenon has not presented itself. This animal, which is supposed by Alafsen and Porelsen to be a variation of the wood or economical mouse, displays a surprising degree of sagacity, both in conveying home its provisions, and the manner in which it stores them in the magazine appropriated for that purpose. In a country, says Mr. Pennant, where berries are but thinly dispersed, these little animals are obliged to cross rivers to make their distant forages. In their return with their booty to their magazines, they are obliged to re-cross the stream; of which Mr. Alafsen gives the following account: "The party, which consists of from six to ten, select a piece of dried cow-dung, on which they place the berries on a heap in the middle: then, by their united force, bring it to the water's edge, and, after launching it, embark and place themselves round the heap, with their heads joined over it, and their backs to the water, their tails, pendent in the stream, serving the purpose of rudders." Having been apprized of doubts that were entertained on this subject, I made a point of inquiring at different individuals as to the reality of the account, and I am happy in being able to say, that it is now established as an important fact in natural history, by the testimony of two eye-witnesses of unquestionable veracity, the clergyman of Briamslok, and Madame Benedictson of Stikesholm; both of whom assured me that they had seen the expedition performed repeatedly. Madame B. in particular, recollected having spent a whole afternoon, in her younger days, at the margin of a small lake on which these navigators had embarked, and amused herself and her companions by driving them away from the side of the lake as they approached them. I was also informed that they make use of dried mushrooms as sacks in which they convey their provisions to the river, and thence to their homes. Nor is the structure of their nests less remarkable. From the surface of the ground, a long passage runs into the earth, similar to that of the Icelandic houses, and terminates in a large and deep hole, intended to receive any water that may find its way through the passage, and serving at the same time as a place for their dung. About two-thirds of the passage, in two diagonal roads, lead to their sleeping apartment and their magazine, which they always continue to keep free from wet."—ED.

young at a time, and that but once a-year, in the spring.[12]

THE MUSK RAT.

OF these animals of the rat kind, but with a musky smell, there are also three distinctions, as of the former; the ONDATRA, the DESMAN, and the PILORI. The ondatra is a native of Canada, the desman of Lapland, and the pilori of the West India islands. The ondatra differs from all others of its kind, in having the tail flatted and carried edge-ways. The desman has a long extended snout, like the shrew-mouse; and the pilori a short tail, as thick at one end as the other. They all resemble each other in being fond of the water, but particularly in that musky odour from whence they have taken their name.

Of these the ONDATRA is the most remarkable, and has been the most minutely described.[13] This animal is about the size of a small rabbit, but has the hair, the colour, and the tail of a rat, except that it is flatted on the sides, as mentioned above. But it is still more extraordinary upon other accounts, and different from all other animals whatever. It is so formed that it can contract and enlarge its body at pleasure. It has a muscle like that of horses, by which they move their hides, lying immediately under the skin, and that furnished with such a power of contraction, together with such an elasticity in the false ribs, that this animal can creep into a hole where others, seemingly much less, cannot follow. The female is remarkable also for two distinct apertures, one for urine, the other for propagation. The male is equally observable for a peculiarity of conformation; the musky smell is much stronger at one particular season of the year than any other; and the marks of the sex seem to appear and disappear in the same manner.

The ondatra in some measure resembles the beaver in its nature and disposition. They both live in society during winter; they both form houses of two feet and a half wide, in which they reside several families together. In these they do not assemble to sleep as the marmout, but purely to shelter themselves from the rigour of the season. However, they do not lay up magazines of provision like the beaver; they only form a kind of covert-way to and round their dwelling, from whence they issue to procure water and roots, upon which they subsist. During winter their houses are covered under a depth of eight or ten feet of snow; so that they must lead but a cold, gloomy, and necessitous life, during its continuance. During summer they separate two by two, and feed upon the variety of roots and vegetables that the season offers. They then become extremely fat, and are much sought after, as well for their flesh as their skins, which are very valuable. They then also acquire a very strong scent of musk, so pleasing to a European, but which the savages of Canada cannot abide. What we admire as a perfume, they consider as a most abominable stench, and call one of their rivers, on the banks of which this animal is seen to burrow in numbers, by the name of the *stinking river*, as well as the rat itself, which is denominated by them the *stinkard*. This is a strange diversity among mankind; and, perhaps, may be ascribed to the different kinds of food among different nations. Such as chiefly feed upon rancid oils and putrid flesh, will often mistake the nature of scents; and, having been long used to ill smells, will, by habit, consider them as perfumes. Be this as it will, although these nations of northern savages consider the musk rat as intolerably fetid, they nevertheless regard it as very good eating; and, indeed, in this they imitate the epicures of Europe very exactly, whose taste seldom relishes a dish till the nose gives the strongest marks of disapprobation. As to the rest, this animal a good deal resembles the beaver in its habits and disposition: but, as its instincts are less powerful, and its economy less exact, I will reserve for the description of that animal a part of what may be applicable to this.

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[12] In the system of nature the dormouse forms a distinct genus, of which there are four species, the fat, the wood, the garden, and the common dormouse.

The wood-mouse of Shaw, field-rat of Pennant, or mulot of Buffon, is in general under five inches long, and the tail rather less, but it varies considerably in dimensions. Its colour is very dark, yellowish-brown, whitish on the under part; the tail is dark-brown above, and dirty-white underneath; but as it varies in size, and is an inhabitant of a large portion of the earth, so it also varies in colour. Its head is both thicker and larger, comparatively with the body, than that of the rat; the eyes are very large and prominent; the ears are large; and the animal stands higher than the rat. The mulot or wood-mouse is found throughout Europe, and, though rarely, in Russia. It is a very destructive little animal, as its habits induce it, like the squirrel, to lay up a large store of winter provision, consisting of nuts, acorns, corn, &c. These animals multiply occasionally to an extraordinary degree, and become great pests by their predatory and wasteful habits.

The harvest-mouse is probably the smallest of British quadrupeds, the body not exceeding two inches and a quarter in length, and the tail two inches; and the weight is said to be about one-sixth of an ounce. Either this species is exclusively British, or it has hitherto escaped the industrious researches of the continental naturalists, for it is doubtful whether it can be identified with the *Mus Pendulinus* of Hermann. Mr. White, in his history of Selbourn, first made this species known to the public. "These mice," he says, "are much smaller and more slender than the mus domesticus medius of Ray, and have more of the squirrel or dormouse colour; their belly is white; a straight line along their sides divides the shades of their back and belly. They never enter into houses; are carried into ricks and barns with the sheaves; abound in harvest, and build their nest amidst the straws of corn above ground, and sometimes in thistles. They breed as many as eight at a litter, in a little brown nest, composed of blades of grass or wheat. The nest is most artificially plaited, and composed of the blades of wheat, perfectly round, and about the size of a cricket-ball, with the aperture so ingeniously closed, that there is no discovering to what part it belongs. It is so compact and well-fitted, that it will roll across a table without being discomposed, though it contained eight little mice, which are naked and blind. As the nest is perfectly full, how could the dam," asks Mr. White, "come at her litter respectively, so as to administer a teat to each? Perhaps she opens different places for that purpose, adjusting them again when the business is over; but she could not possibly be contained herself in the ball with her young, which, moreover, would be daily increasing in bulk." Mr. White informs us, that though they constructed nests for breeding above ground, and are found most abundantly in corn-ricks in Hampshire, they nevertheless burrow in winter, and pass the severe season underground.—ED.

[13] Buffon, vol. xx. p 4.

THE CRICETUS.

The cricetus, or German rat, which Mr. Buffon calls the *hamster*, greatly resembles the water-rat in its size, small eyes, and the shortness of its tail. It differs in colour, being rather browner, like the Norway rat, with the belly and legs of a dirty yellow. But the marks by which it may be distinguished from all others are two pouches, like those of a baboon, on each side of its jaw, under the skin, into which it can cram a large quantity of provision. These bags are oblong, and of the size, when filled, of a large walnut. They open into the mouth, and fall back along the neck to the shoulder. Into these the animal can thrust the surplus of those fruits or grains it gathers in the fields, such as wheat, pease, or acorns. When the immediate calls of hunger are satisfied, it then falls to filling these; and thus loaded with two great bunches on each side of the jaw, it returns home to its hole to deposit the spoil as a store for the winter. The size, the fecundity, and the voraciousness of this animal, render it one of the greatest pests in the countries where it is found, and every method is made use of to destroy it.[14]

But although this animal is very noxious with respect to man, yet, considered with regard to those instincts which conduce to its own support and convenience, it deserves our admiration.[15] Its hole offers a very curious object for contemplation, and shows a degree of skill superior to the rest of the rat kind. It consists of a variety of apartments, fitted up for the different occasions of the little inhabitant. It is generally made on an inclining ground, and always has two entrances, one perpendicular, and the other oblique; though, if there be more than one in a family, there are as many perpendicular holes as there are individuals below. The perpendicular hole is usually that through which they go in and out: the oblique serves to give a thorough air to keep the retreat clean, and in case one hole is stopped, to give an exit at this. Within about a foot of the perpendicular hole, the animal makes two more, where are deposited the family's provisions. These are much more spacious than the former, and are large in proportion to the quantity of the store. Beside these, there is still another apartment warmly lined with grass and straw, where the female brings forth her young; all these communicate with each other, and all together take up a space of ten or twelve feet in diameter. These animals furnish their store-houses with dry corn, well cleaned; they also lay in corn in the ear, and beans and pease in the pod. These, when occasion requires, they afterwards separate, carrying out the pods and empty ears by their oblique passage. They usually begin to lay in at the latter end of August; and, as each magazine is filled, they carefully cover up the mouth with earth, and that so neatly that it is no easy matter to discover where the earth has been removed. The only means of finding out their retreats are, therefore, to observe the oblique entrance, which generally has a small quantity of earth before it; and this, though often several yards from their perpendicular retreat, leads those who are skilled in the search to make the discovery. Many German peasants are known to make a livelihood by finding out and bringing off their hoards, which, in a fruitful season, often furnish two bushels of good grain in each apartment.

Like most others of the rat kind, they produce twice or thrice a-year, and bring five or six at a time. Some years they appear in alarming numbers, at other times they are not so plentiful. The moist seasons assist their propagation; and it often happens on such years that their devastations produce a famine all over the country. Happily, however, for mankind, these, like the rest of their kind, destroy each other; and of two that Mr Buffon kept in a cage, male and female, the latter killed and devoured the former. As to the rest, their fur is considered as very valuable; the natives are invited by rewards to destroy them; and the weasel kind seconds the wishes of government with great success. Although they are usually found brown on the back and white on the belly, yet many of them are observed to be gray; which may probably arise from the difference of age.[16]

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[14] Among animals of this kind, which are furnished with pouches on each side of the mouth, the most remarkable is the Canada rat. Its size is that of the Norway rat, though of a more lengthened form. Its colour is a pale grayish-brown, paler beneath. The pouches attached to the cheeks are of a very large size, shaped somewhat like an egg, reach to the ground, and have the appearance of a pair of inflated bladders.

The anomalous hamster, found in the Isle of Trinity, is about the size of the common rat, but the nose is more pointed; the ears are naked, round, and of moderate size; the pouches are formed by a duplicature of the common tegument, like the pouch of the opossum, and are of considerable size. The body is covered with fine lance-shaped spines, stronger on the back than elsewhere, intermixed with hair. This species differs perhaps generically from the other hamsters, with which, indeed, it seems to have no other relationship than by the cheek-pouches.—Ed.

[15] Buffon, vol. xxvi. p. 159.

THE LEMING.

HAVING considered various kinds of these anxious little animals that elude the indignation of mankind, and subsist by their number, not their strength, we come to a species more bold, more dangerous, and more numerous than any of the former. The leming, which is a native of Scandinavia, is often seen to pour down in myriads from the northern mountains, and, like a pestilence, destroy all the productions of the earth. It is described as being larger than a dormouse, with a bushy tail, though shorter. It is covered with thin hair of various colours. The extremity of the upper part of the head is black, as are likewise the neck and shoulders, but the rest of the body is reddish, intermixed with small black spots of various figures, as far as the tail, which is not above half-an-inch long. The eyes are little and black, the ears round and inclining towards the back, the legs before are short, and those behind longer, which gives it a great degree of swiftness. But what it is much more remarkable for than its figure are, its amazing fecundity and extraordinary migrations.

In wet seasons, all of the rat kind are known to propagate more than in dry; but this species in particular is so assisted in multiplying by the moisture of the weather, that the inhabitants of Lapland sincerely believe that they drop from the clouds, and that the same magazines that furnish hail and snow pour down the leming also upon them. In fact, after long rain, these animals set forward from their native mountains, and several millions in a troop deluge the whole plain with their numbers.[17] They move, for the most part, in a square, marching forward by night, and lying still by day. Thus, like an animated torrent, they are often seen more than a mile broad covering the ground, and that so thick that the hindmost touches its leader. It is in vain that the poor inhabitant resists or attempts to stop their progress, they still keep moving forward, and though thousands are destroyed, myriads are seen to succeed, and make their destruction impracticable. They generally move in lines, which are about three feet from each other, and exactly parallel. Their march is always directed from the north-west to the south-east, and regularly conducted from the beginning. Wherever their motions are turned, nothing can stop them; they go directly forward, impelled by some strange power; and, from the time they first set out, they never once think of retreating. If a lake or a river happens to interrupt their progress, they all together take the water and swim over it; a fire, a deep well, or a torrent does not turn them out of their straight lined direction; they boldly plunge into the flames, or leap down the well, and are sometimes seen climbing up on the other side. If they are interrupted by a boat across a river while they are swimming, they never attempt to swim round it, but mount directly up its sides; and the boatmen, who know how vain resistance in such a case would be, calmly suffer the living torrent to pass over, which it does without further damage. If they meet with a stack of hay or corn that interrupts their passage, instead of going over it, they gnaw their way through; if they are stopped by a house in their course, if they cannot get through it, they continue there till they die. It is happy, however, for mankind, that they eat nothing that is prepared for human subsistence; they never enter a house to destroy the provisions, but are contented with eating every root and vegetable that they meet. If they happen to pass through a meadow, they destroy it in a very short time, and give it an appearance of being burned up and strewed with ashes. If they are interrupted in their course, and a man should imprudently venture to attack one of them, the little animal is no way intimidated by the disparity of strength, but furiously flies up at its opponent, and barking somewhat like a puppy, wherever it fastens does not easily quit the hold. If at last the leader be forced out of its line, which it defends as long as it can, and be separated from the rest of its kind, it sets up a plaintive cry, different from that of anger, and, as some pretend to say, gives itself a voluntary death, by hanging itself on the fork of a tree.

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[16] The genus gerboa approximates considerably to the rats properly so called, by a great number of characters of internal organization, but is sufficiently distinguished by the shortness of the anterior limbs, and the length of the hinder extremities, or to speak more correctly, of the hinder metatarsi, and by the tail, which is covered with long hairs at its extremities. As to external conformation, the gerboas exhibit some relations with the kangaroos. The form of the body is the same in general. The hinder limbs are likewise five or six times stronger than the fore. In both generally the tail is very long, the ears elongated and pointed, and the eyes very large and round. But though the kangaroos have so many treats of external conformation similar to the gerboas, they are infinitely removed from them in most important points, such as the organs of generation, ventral pouch, &c. The gerboas have the same teeth as the rats, that is, they have two incisors in each jaw; and the lower, instead of being flat and cut scissors-like, as the upper, on the contrary, are conic and pointed. The molars are generally six in number, three on each side. They are slightly sloped. There is sometimes an additional one in the upper jaw. In the gerboas the cheek-bones are very prominent, which gives a singular and flatted form to the front part of the head. The muzzle is short, large, and obtuse. A considerable number of stiff hairs extend on each side, and form long mustachios. The nose is naked, cartilaginous, and in one species rather complicated. The ears are long and pointed; the eyes large, and placed altogether on the sides of the head. The body is a little elongated, larger behind than before, and well covered with soft and silken hairs. The fore-feet are very short and feeble. They have four or five toes according to the species. The thumb or interior toe, where it exists, is very short, rounded at its extremity, and provided with an obtuse nail. The other toes are long and armed with crooked nails. The hind-feet are as disproportioned as those of the kangaroos, being four or five times longer than the fore-feet. They are terminated by five or six toes, according to the species, which are armed with short, but large and obtuse claws.

Ancient and modern naturalists have both been mistaken respecting the walk of the gerboa. They have all imagined that these quadrupeds walked on their hind-feet only, never employing the fore-feet for that purpose. From this error the genus was named *dipus*, two legged. It usually walks on its four feet; but when frightened from any cause, it endeavours to escape by means of prodigious leaps, which it executes with equal force and activity. When these animals are about to leap, they raise their body upon the extremity of their hind toes, and support themselves upon their tail. Their fore-feet are so closely attached to their breast, they are scarcely visible. Having taken their spring, they leap, and fall upon their four feet; then they elevate themselves again with so much celerity, that it almost appears that they are constantly in an erect posture.

The genus gerboa is now composed of several distinct species, one of which is extremely abundant in Barbary, in Higher and Lower Egypt, and Syria, and again in the more northern climates, situated between the Tanais and the Volga. The others occupy an immense space in Siberia and the north part of Russia, from Syria to the Eastern ocean, and as far as the northern parts of Hindostan. A late one, recently described by M. de Blainville, has been published, though it would seem erroneously, as belonging to New Holland.—ED.

[17] Phil. Trans. vol. ii. p. 872.

An enemy so numerous and destructive would quickly render the countries where they appear utterly uninhabitable, did it not fortunately happen, that the same rapacity that animates them to destroy the labours of mankind, at last impels them to destroy and devour each other.[18] After committing incredible devastations, they are at last seen to separate into two armies, opposed with deadly hatred, along the coasts of the larger lakes and rivers. The Laplanders, who observe them thus drawn up to fight, instead of considering their mutual animosities as a happy riddance of the most dreadful pest, form ominous prognostics from the manner of their arrangement. They consider their combats as a presage of war, and expect an invasion from the Russians or the Swedes, as the sides next those kingdoms happen to conquer. The two divisions, however, continue their engagements and animosity until one party overcomes the other. From that time they utterly disappear, nor is it well known what becomes of either the conquerors or the conquered. Some suppose that they rush headlong into the sea; others, that they kill themselves, as some are found hanging on the forked branches of a tree; and others still, that they are destroyed by the young spring herbage. But the most probable opinion is, that, having devoured the vegetable productions of the country, and having nothing more to subsist on, they then fall to devouring each other; and, having habituated themselves to that kind of food, continue it. However this be, they are often found dead by thousands, and their carcasses have been known to infect the air for several miles round, so as to produce very malignant disorders. They seem also to infect the plants they have gnawed, for the cattle often die that afterwards feed in the places where they passed.

As to the rest, the male is larger and more beautifully spotted than the female. They are extremely prolific; and, what is extraordinary, their breeding does not hinder their march; for some of them have been observed to carry one young one in their mouth, and another on their back. They are greatly preyed upon by the ermine, and, as we are told, even by the rein-deer. The Swedes and Norwegians, who live by husbandry, consider an invasion from these vermin as a terrible visitation; but it is very different with respect to the Laplanders, who lead a vagrant life, and who, like the lemings themselves, if their provisions be destroyed in one part of the country, can easily retire to another. These are never so happy as when an army of lemings come down amongst them; for then they feast upon their flesh; which, though horrid food, and which, though even dogs and cats are known to detest, these little savages esteem very good eating, and devour greedily. They are glad of their arrival also upon another account, for they always expect a great plenty of game the year following, among those fields which the lemings have destroyed.

THE MOLE.

To these minute animals of the rat kind, a great part of whose lives is passed in holes under ground, I will subjoin one little animal more, no way resembling the rat, except that its whole life is spent there. As we have seen some quadrupeds formed to crop the surface of the fields, and others to live upon the tops of trees, so the mole is formed to live wholly under the earth, as if nature meant that no place should be left wholly untenanted. Were we from our own sensations to pronounce upon the life of a quadruped that was never to appear above ground, but always condemned to hunt for its prey underneath, obliged, whenever it removed from one place to another, to bore its way through a resisting body, we should be apt to assert that such an existence must be the most frightful and solitary in nature. However, in the present animal, though we find it condemned to all those seeming inconveniences, we shall discover no signs of wretchedness or distress. No quadruped is fatter, none has a more sleek or glossy skin; and, though denied many advantages that most animals enjoy, it is more liberally possessed of others, which they have in a more scanty proportion.

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[18] Dictionnaire Raisonnée, vol. ii. p. 610.

This animal, so well known in England, is, however, utterly a stranger in other places, and particularly in Ireland. For such, therefore, as have never seen it, a short description will be necessary. And, in the first place, though somewhat of a size between the rat and the mouse, it no way resembles either, being an animal entirely of a singular kind; and perfectly unlike any other quadruped whatever. It is bigger than a mouse, with a coat of fine, short, glossy, black hair. Its nose is long and pointed, resembling that of a hog, but much longer. Its eyes are so small, that it is scarcely possible to discern them. Instead of ears, it has only holes in the place. Its neck is so short that the head seems stuck upon the shoulders. The body is thick and round, terminating by a very small short tail, and its legs also are so very short, that the animal seems to lie flat on its belly. From under its belly, as it rests in this position, the four feet appear just as if they immediately grew out of the body. Thus the animal appears to us at first view as a mass of flesh covered with a fine, shining, black skin, with a little head, and scarcely any legs, eyes, or tail. On a closer inspection, however, two little black points may be discerned, that are its eyes. The ancients, and some of the moderns, were of opinion that the animal was utterly blind; but Derham, by the help of a microscope, plainly discovered all the parts of the eye that are known in other animals, such as the pupil, the vitreous and the crystalline humours. The fore-legs appear very short and strong, and furnished with five claws to each. These are turned outwards and backwards, as the hands of a man when swimming. The hind-legs are longer and weaker than the fore, being only used to assist its motions; whereas the others are continually employed in digging. The teeth are like those of a shrew-mouse, and there are five on both sides of the upper jaw, which stand out; but those behind are divided into points. The tongue is as large as the mouth will hold.

Such is the extraordinary figure and formation of this animal, which, if we compare with its manner of living, we shall find a manifest attention in nature to adapt the one to the other.[19] As it is allotted a subterraneous abode, the seeming defects of its formation vanish, or rather are turned to its advantage. The breadth, strength, and shortness of the fore-feet, which are inclined outwards, answer the purposes of digging, serving to throw back the earth with greater ease, and to pursue the worms and insects which are its prey: had they been longer, the falling in of the earth would have prevented the quick repetition of its strokes in working: or have obliged it to make a larger hole in order to give room for their exertion. The form of the body is not less admirably contrived for its way of life. The fore-part is thick, and very muscular, giving great strength to the action of the fore-feet, enabling it to dig its way with amazing force and rapidity, either to pursue its prey, or elude the search of the most active enemy. By its power of boring the earth, it quickly gets below the surface; and I have seen it, when let loose in the midst of a field, like the ghost on a theatre, instantly sink into the earth; and the most active labourer, with a spade, in vain attempted to pursue.

The smallness of its eyes, which induced the ancients to think it was blind, is, to this animal, a peculiar advantage. A small degree of vision is sufficient for a creature that is ever destined to live in darkness. A more extensive sight would only have served to show the horrors of its prison, while nature has denied it the means of an escape. Had this organ been larger, it would have been perpetually liable to injuries by the falling of the earth into it; but nature, to prevent that inconvenience, has not only made them very small, but very closely covered them with hair. Anatomists mention, besides these advantages, another that contributes to their security; namely, a certain muscle, by which the animal can draw back the eye whenever it is necessary or in danger.

As the eye is thus perfectly fitted to the animal's situation, so also are the senses of hearing and smelling. The first gives it notice of the most distant appearance of danger; the other directs it, in the midst of darkness, to its food. The wants of a subterraneous animal can be but few; and these are sufficient to supply them: to eat, and to produce its kind, are the whole employment of such a life; and for both these purposes it is wonderfully adapted by nature.[20]

Thus admirably is this animal fitted for a life of darkness and solitude; with no appetites but what it can easily indulge, with no enemies but what it can easily evade or conquer. As soon as it has once buried itself in the earth, it seldom stirs out unless forced by violent rains in summer; or, when in pursuit of its prey, it happens to come too near the surface, and thus gets into the open air, which may be considered as its unnatural element. In general, it chooses the looser, softer grounds, beneath which it can travel with greater ease; in such also it generally finds the greatest number of worms and insects, upon which it chiefly preys. It is observed to be most active, and to cast up most earth, immediately before rain; and, in winter, before a thaw: at those times the worms and insects begin to be in motion, and approach the surface, whither this industrious animal pursues them. On the contrary, in very dry weather, the mole seldom or never forms any hillocks; for then it is obliged to penetrate deeper after its prey, which at such seasons retire far into the ground.

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[19] British Zoology.

[20] "Testes habet maximos, parastatas amplissimas, novum corpus seminale ab his diversum ac separatum. Penem etiam facile omnium, ni fallor, animalium longissimum, ex quibus colligere est maximam præ reliquis omnibus animalibus voluptatem in coitu, hoc abjectum et vile animalculum percipere, ut habeant quod ipsi invideant qui in hoc supremas vitæ suæ delicias collocant." *Raii Synops. Quadrup. p.* 239. Huic opinioni assentitur D. Buffon, attamen non mihi apparet magnitudinem partium talem voluptatem augere. Maribus enim salacissimis contrarium obtinet.

As the moles very seldom come above ground, they have but few enemies; and very readily evade the pursuit of animals stronger and swifter than themselves.[21] Their greatest calamity is an inundation; which, wherever it happens, they are seen in numbers attempting to save themselves by swimming, and using every effort to reach the higher grounds.[22] The greatest part, however, perish, as well as their young, which remain in the holes behind. Were it not for such accidents, from their great fecundity, they would become extremely troublesome; and, as it is, in some places they are considered by the farmer as his greatest pest. They couple towards the approach of spring; and their young are found about the beginning of May. They generally have four or five at a time; and it is easy to distinguish among other mole-hills, that in which the female has brought forth her young. These are made with much greater art than the rest, and are usually larger. The female, in order to form this retreat, begins by erecting the earth into a tolerably spacious apartment, which is supported within by partitions, at proper distances, that prevent the roof from falling. All round this she works and beats the earth very firm, so as to make it capable of keeping out the rain, let it be never so violent. As the hillock, in which this apartment is thus formed, is raised above ground, the apartment itself is consequently above the level of the plain, and, therefore, less subject to accidental slight inundations. The place being thus fitted, she then procures grass and dry leaves as a bed for her young. There they lie secure from wet, and she continues to make their retreat equally so from danger; for all round this hill of her own raising, are holes running into the earth, that part from the middle apartment, like rays from a centre, and extend about fifteen feet in every direction; these resemble so many walks or chases, into which the animal makes her subterraneous excursions, and supplies her young with such roots or insects as she can provide: but they contribute still more to the general safety; for as the mole is very quick of hearing, the instant she perceives her little habitation attacked, she takes to her burrow, and unless the earth be dug away by several men at once, she and her young always make good a retreat.

The mole is scarcely found, except in cultivated countries: the varieties are but few. That which is found in Virginia resembles the common mole, except in colour, which is black, mixed with a deep purple. There are sometimes white moles, seen particularly in Poland, rather larger than the former. As their skin is so very soft and beautiful, it is odd that it has not been turned to any advantage. Agricola tells us, that he saw hats made from it, the finest and the most beautiful that could be imagined.[23]

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[21] Buffon.

[22] In a paper in the 'Linnæan Transactions,' Mr. Bruce makes the following statement: "On visiting the loch of Clunie, I observed in it a small island at the distance of one hundred and eighty yards from the nearest land, measured upon the ice. Upon the island, the Earl of Airlie, the proprietor, had a small castle and shrubbery. I remarked frequently the appearance of fresh mole-casts, or hills. I for some time took them for those of the water mouse, and one day asked the gardener if it was so. 'No,' he said; 'it was the mole; and that he had caught one or two lately.' Five or six years ago, he caught two in traps, and for two years after this he had observed none. But, about four years ago, coming ashore one summer's evening in the dusk, he and the Earl of Airlie's butler, they saw at a short distance upon the smooth water some animal paddling towards the island! They soon closed with this feeble passenger, and found it to be the common mole, led by a most astonishing instinct from the castle hill, the nearest point of land, to take possession of this desert island. It had been at the time of my visit, for the space of two years, quite free from any subterraneous inhabitant; but the mole has for more than a year past made its appearance again, and its operations I have since been witness to."—Ed.

[23] The zemni, or *blind rat* of Pennant and Shaw, to which Guldenstaedt applied the Greek name *spalax*, has been hitherto referred to the mole. This singular animal attains nearly ten inches in length, and its cylindrical body is full two inches in diameter. Its thick head, nearly pyramidical, narrower in front, is terminated by a very hard and strong cartilaginous muzzle. The nostrils are round and narrow; the opening of the mouth is small. The incisive teeth are extremely prominent and strong, those in the lower jaw twice the length of the others; the under lip is shorter than the upper, and does not cover the teeth. Aristotle has observed that externally there are no traces of eyes: if the skin of the head be taken off, a tendinous expansion may be perceived extending over the orbits, immediately under which is a glandulous body, oblong, a little flatted, toward the middle of which is a black spot representing the globe of the eye, and which appears perfectly well organized, though not half a line in thickness. Nothing in short appears wanting to constitute a perfect eye, but a greater development of parts. Whether the spalax be absolutely blind, or whether it receive any perception of light through the medium of the eye as an organ, does not sufficiently appear by what has hitherto been said by its describers. The presence of what may be called the vestige of an organ, seems perfectly consistent with other instances, in which the application of such imperfect organ is not at all to be traced. On the contrary, it accords with that apparent unwillingness in nature to depart from prescribed laws. The total absence of an accustomed organ is much more anomalous in nature than the complete inutility of an imperfect one. So it seems with the spalax, which is not without the vestige of eyes, though their application as organs of sight seems doubtful. The spalax has the organs of hearing in a very perfect state.

CHAP. II.

ANIMALS OF THE HEDGEHOG, OR PRICKLY KIND.

Animals of the hedgehog kind require but very little accuracy to distinguish them from all others. That hair which serves the generality of quadrupeds for warmth and ornament is partly wanting in these; while its place is supplied by sharp spines or prickles, that serve for their defence. This general characteristic, therefore, makes a much more obvious distinction than any that can be taken from their teeth or their claws. Nature, by this extraordinary peculiarity, seems to have separated them in a very distinguished manner; so that, instead of classing the hedgehog among the moles, or the porcupine with the hare, as some have done, it is much more natural and obvious to place them, and others approaching them in this strange peculiarity, in a class by themselves: nor let it be supposed, that while I thus alter their arrangement, and separate them from animals with which they have been formerly combined, that I am destroying any secret affinities that exist in nature. It is natural, indeed, for readers to suppose, when they see two such opposite animals as the hare and the porcupine assembled together in the same group, that there must be some material reason, some secret connexion, for thus joining animals so little resembling each other in appearance. But the reasons for this union were very slight, and merely arose from a similitude in the fore-teeth: no likeness in the internal conformation, no similitude in nature, in habitudes, or disposition; in short, nothing to fasten the link that combines them, but the similitude in the teeth: this, therefore, may be easily dispensed with; and, as was said, it will be most proper to class them according to their most striking similitudes.

The hedgehog, with an appearance the most formidable, is yet one of the most harmless animals in the world: unable or unwilling to offend, all its precautions are only directed to its own security; and it is armed with a thousand points, to keep off the enemy, but not to invade him. While other creatures trust to their force, their cunning, or their swiftness, this animal, destitute of all, has but one expedient for safety; and from this alone it often finds protection. As soon as it perceives itself attacked, it withdraws all its vulnerable parts, rolls itself into a ball, and presents nothing but its defensive thorns to the enemy; thus, while it attempts to injure no other quadruped, they are equally incapable of injuring it; like those knights, we have somewhere read of, who were armed in such a manner, that they could neither conquer others, nor be themselves overcome.

This animal is of two kinds; one with a nose like the snout of a hog; the other, more short and blunt, like that of a dog. That with the muzzle of a dog is the most common, being about six inches in length, from the tip of the nose to the insertion of the tail. The tail is little more than an inch long; and so concealed by the spines, as to be scarce visible: the head, back, and sides, are covered with prickles; the nose, breast, and belly, are covered with fine soft hair;[1] the legs are short, of a dusky colour, and almost bare; the toes on each foot are five in number, long and separated; the prickles are about an inch in length, and very sharp pointed; their lower part is white, the middle black, and the points white: the eyes are small, and placed high in the head; the ears are round, pretty large, and naked; the mouth is small, but well furnished with teeth; these, however, it only uses in chewing its food, but neither in attacking or defending itself against other animals. Its only reliance in cases of danger, is on its spines; the instant it perceives an enemy, it puts itself into a posture of defence, and keeps upon its guard until it supposes the danger over. On such occasions, it immediately alters its whole appearance: from its usual form, somewhat re-

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What is denied on the one hand is prodigally bestowed on the other, and the creature is thereby enabled to preserve its existence. The external ear, indeed, has but a very small outward expansion, but the auditory canal is very large, and the whole organ internally greatly developed. The neck of this animal is large, short, and muscular, by which the head is capable of considerable strength considered relatively to its size, and the whole animal takes a cylindrical shape; the feet are short, armed with round trenchant nails, rather larger on the hind feet than on those before. The whole animal is covered with a short soft fur, the base of which is blackish ash-colour, and the extremity reddish, whence results a general tint of yellowish gray. They are sometimes found spotted with white.

The Greeks, as has been generally assumed, described the mole, ασπαλαξ, as blind, an error which modern zoologists have piqued themselves in detecting. The ασπαλαξ of the Greeks was, however, doubtless, the animal now under consideration, which was indigenous in their country or around them, whereas the mole was an exotic in Greece. The Romans may bear the blame of having led us into this error by rendering the word ασπαλαξ into *talpa*, and applying that word to the mole of Europe.

The spalax lives gregariously underground. They bore excavations which are not far from the surface, in search of food, but dig a hole lower in the earth for personal retreat and safety. They prefer cultivated grounds, and as they subsist principally, if not entirely on roots, they become serious destroyers of the fruits of agriculture. Their movements are precipitate, turning or running sideways, or even backward with facility, when driven and in danger, and they bite with great force and effect. When on the surface, they almost always carry the head raised apparently for the purpose more effectually of hearing what is passing around them; thus relying on their most perfect faculty for a forewarning of approaching danger, which they have not the means of detecting by sight.—Ed.

[1] Præputium propendus. Linnæi Syst. 75. And of the female he might have said, resupina copulatur

sembling a small animal, with a bunch on its back, the animal begins to bend its back, to lay its head upon its breast, to shut its eyes, to roll down the skin of its sides towards the legs, to draw these up, and, lastly, to tuck them in on every side, by drawing the skin still closer. In this form, which the hedgehog always puts on, when disturbed, it no way resembles an animal, but rather a roundish mass of prickles, impervious on every side. The shape of the animal thus rolled up, somewhat resembles a chestnut in the husk; there being, on one side, a kind of flat space, which is that on which the head and legs have been tucked in.

Such is the usual appearance of the hedgehog, upon the approach of any danger. Thus rolled up in a lump, it patiently waits till its enemy passes by, or is fatigued with fruitless attempts to annoy it. The cat, the weasel, the ferret, and the marten, quickly decline the combat; and the dog himself generally spends his time in empty menaces rather than in effectual efforts. Every increase of danger only increases the animal's precautions to keep on its guard; its assailant vainly attempts to bite, since he thus more frequently feels than inflicts a wound; he stands enraged and barking, and rolls it along with his paws; still, however, the hedgehog patiently submits to every indignity, but continues secure; and still more to disgust its enemy with the contest, sheds its urine, the smell of which is alone sufficient to send him away. In this manner the dog, after barking for some time, leaves the hedgehog where he found him; who perceiving the danger past, at length peeps out from its ball, and, if not interrupted, creeps slowly to its retreat.

The hedgehog, like most other wild animals, sleeps by day, and ventures out by night. It generally resides in small thickets, in hedges, or in ditches covered with bushes; there it makes a hole of about six or eight inches deep, and lies well wrapped up, in moss, grass, or leaves. Its food is roots, fruits, worms, and insects. It is also said to suck cattle, and hurt their udders; but the smallness of its mouth will serve to clear it from this reproach. It is said also to be very hurtful in gardens and orchards, where it will roll itself in a heap of fruit, and so carry a large quantity away upon its prickles; but this imputation is as ill grounded as the former, since the spines are so disposed, that no fruit will stick upon them, even if they should try to fix them on. It rather appears to be a very serviceable animal, in ridding our fields of insects and worms, which are so prejudicial to vegetation.[2]

Mr. Buffon, who kept these animals tame about his house, acquits them of the reproach of being mischievous in the garden; but then he accuses them of tricks, of which from the form and habits of this animal one would be never led to suspect them. “I have often,” says he, “had the female and her young brought me about the beginning of June: they are generally from three to five in number: they are white in the beginning, and only the marks of their spines appear: I was willing to rear some of them, and accordingly put the dam and her young into a tub, with abundant provision beside them; but the old animal, instead of suckling her young, devoured them all, one after another. On another occasion, a hedgehog that had made its way into the kitchen, discovered a little pot, in which there was meat prepared for boiling; the mischievous animal drew out the meat, and left its excrements in the stead. I kept males and females in the same apartment, where they lived together but never coupled. I permitted several of them to go about my garden; they did very little damage, and it was scarcely perceivable that they were there: they lived upon the fruits that fell from the trees; they dug the earth into shallow holes; they eat caterpillars, beetles, and worms; they were also very fond of flesh, which they devoured boiled or raw.”

[2] “M. Lenz and Professor Buckland declare that the most violent animal poisons have no effect on the hedgehog, which kills and eats adders and vipers. M. Lenz says that he had in his house a female hedgehog, kept in a large box, and which soon became very mild and familiar. He often put into the box some adders, which it attacked with avidity, seizing them indifferently by the head, the body, or the tail, and did not appear alarmed or embarrassed when they coiled themselves around its body. On one occasion M. Lenz witnessed a fight between a hedgehog and a viper. When the hedgehog came near and smelled the snake—for with these animals the sense of sight is very obtuse—she seized it by the head, and held it fast between her teeth, but without appearing to do it much harm; for having disengaged its head, it assumed a furious and menacing attitude, and hissing vehemently, inflicted several severe bites on the hedgehog. The little animal, however, did not recoil from the bites of the viper, or indeed seem to care much about them. At last, when the reptile was fatigued by its efforts, she again seized it by the head, which she ground between her teeth, compressing the fangs and glands of poison, and then devouring every part of the body. M. Lenz says that battles of this sort often occurred in the presence of many persons; and sometimes the hedgehog has received eight or ten wounds on the ears, the snout, and even on the tongue, without appearing to experience any of the ordinary symptoms produced by the venom of the viper. Neither herself nor the young which she was then suckling seemed to suffer from it. This observation agrees with that of Pallas, who assures us that the hedgehog can eat about a hundred cantharides, without experiencing any of the effects which this insect, taken inwardly, produces on men, dogs, and cats. A German physician who made the hedgehog a particular object of study, gave it a strong dose of prussic acid, of arsenic, of opium, and of corrosive sublimate, none of which did it any harm. The hedgehog in its natural state only feeds on pears, apples, and other fruits. When it can get nothing it likes better, its ordinary food consists of worms, slugs, frogs, adders, and sometimes rats and mice.”—*Gardener and Practical Florist.*

They couple in spring, and bring forth about the beginning of summer. They sleep during the winter, and what is said of their laying up provisions for that season is consequently false. They at no time eat much, and can remain very long without any food whatsoever. Their blood is cold, like all other animals that sleep during the winter. Their flesh is not good for food; and their skins are converted to scarcely any use except to muzzle calves to keep them from sucking.

THE TANREC AND TENDRAC.

THE tanrec and tendrac are two little animals, described by Mr. Buffon, of the hedgehog kind: but yet sufficiently different from it to constitute a different species. Like the hedgehog, they are covered with prickles, though mixed in a greater proportion with hair; but unlike that animal, they do not defend themselves by rolling up in a ball. Their wanting this last property is alone sufficient to distinguish them from an animal in which it makes the most striking peculiarity: as also that in the East Indies, where only they are found, the hedgehog exists separately also; a manifest proof that this animal is not a variety caused by the climate.

The tanrec is much less than the hedgehog,[3] being about the size of a mole, and covered with prickles, like that animal, except that they are shorter and smaller. The tendrac is still less than the former, and is defended only with prickles upon the head, the neck, and the shoulders; the rest being covered with a coarse hair resembling a hog's bristles. These little animals, whose legs are very short, move but slowly. They grunt like a hog; and wallow like it in the mire. They love to be near water, and spend more of their time there than upon land. They are chiefly in creeks and harbours of salt water. They multiply in great numbers, make themselves holes in the ground, and sleep for several months. During this torpid state, their hairs (and I should also suppose their prickles) fall; and they are renewed upon their revival. They are usually very fat; and although their flesh be insipid, soft, and stringy, yet the Indians find it to their taste, and consider it as a very great delicacy.

THE PORCUPINE.

THOSE arms which the hedgehog possesses in miniature the porcupine has in a more enlarged degree. The short prickles of the hedgehog are, in this animal, converted into shafts. In the one, the spines are about an inch long; in the other, a foot. The porcupine is about two feet long, and fifteen inches high. Like the hedgehog, it appears a mass of misshapen flesh, covered with quills, from ten to fourteen inches long, resembling the barrel of a goose-quill in thickness, but tapering and sharp at both ends. These, whether considered separately or together, afford sufficient subject to detain curiosity. Each quill is thickest in the middle; and inserted into the animal's skin, in the same manner as feathers are found to grow upon birds. It is within-side spongy, like the top of a goose-quill; and of different colours, being white and black alternately, from one end to the other. The biggest are often found fifteen inches long, and a quarter of an inch in diameter; extremely sharp, and capable of inflicting a mortal wound. They seem harder than common quills, being difficult to be cut, and solid at that end which is not fixed in the skin. If we examine them in common, as they grow upon the animal, they appear of two kinds, the one such as I have already described; the other, long, flexible, and slender, growing here and there among the former. There is still another sort of quills, that grow near the tail, white and transparent, like writing quills, and that seem to be cut short at the end. All these quills, of whatever kind, incline backwards, like the bristles of a hog; but when the animal is irritated, they rise, and stand upright, as bristles are seen to do.[4]

Such is the formation of this quadruped, in those parts in which it differs from most others: as to the rest of its figure, the muzzle bears some resemblance to that of a hare, but black; the legs are very short, and the feet have five toes, both before and behind; and these, as well as the belly, the head, and all other parts of the body, are covered with a sort of short hair, like prickles, there being no part, except the ears and the sole of the foot, that is free from them; the ears are thinly covered with very fine hair; and are in shape like those of mankind: the eyes are small like those of a hog, being only one-third of an inch from one corner to the other. After the skin is taken off, there appear a kind of paps on those parts of the body from whence the large quills proceed; these are about the size of a small pea, each answering to as many holes which appear on the outward surface of the skin, and which are about half an inch deep, like so many hollow pipes, wherein the quills are fixed, as in so many sheaths.

This animal seems to partake very much of the nature of the hedgehog; having this formidable apparatus of arms rather to defend itself, than annoy the enemy. There have been, indeed, many naturalists who supposed that it was capable of discharging them at its foes, and killing at a great distance off. But this opinion has been entirely discredited of late; and it is now universally believed that its quills remain firmly fixed in the skin, and are then only shed when the animal moults them, as birds do their feathers. It is true, we are told by Ellis, that a wolf at Hudson's Bay was found dead, with the quills of a porcupine fixed within its mouth; which might have very well happened, from the voraciousness of the former, and not the resentment of the latter. That rapacious creature, in the rage of appetite, might have attempted to devour the porcupine, quills and all, and very probably paid the forfeit by its life. However this be, of all the porcupines that have been brought into Europe, not one was ever seen to launch their quills; and yet the irritations they received were sufficient to have provoked their utmost indignation. Of all the porcupines that Dr. Shaw observed in Africa, and he saw numbers, not one ever attempted to dart its quills; their usual manner of defence being, to lie on one side, and when the enemy approaches very near, by suddenly rising, to wound him with the points on the other.[5]

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[3] Buffon, vol. xxv. p. 254.

[4] Professor Thunberg, in his second journey to the island Mature in the Indian ocean, informs us, that the porcupine has a very curious method of fetching water for its young. The quills in the tail are said to be hollow, and to have a hole at the extremity: these the animal can bend in such a manner, as that they can be filled with water, which is afterwards discharged in the nest among its young. —ED.

It is probable, therefore, that the porcupine is seldom the aggressor; and when attacked by the bolder animals, it only directs its quills so as to keep always pointing towards the enemy. These are an ample protection; and, as we are assured by Kolben, at such times even the lion himself will not venture to make an attack. From such, therefore, the porcupine can defend itself; and chiefly hunts for serpents, and all other reptiles, for subsistence. Travellers universally assure us, that between the serpent and the porcupine there exists an irreconcilable enmity, and that they never meet without a mortal engagement.[6] The porcupine, on these occasions, is said to roll itself upon the serpent, and thus destroy and devour it. This may be true; while what we are informed by Monsieur Sarrasin, of the porcupine of Canada chiefly subsisting on vegetables, may be equally so. Those which are brought to this country to be shown, are usually fed on bread, milk, and fruits; but they will not refuse meat when it is offered them; and it is probable they prefer it in a wild state, when it is to be had.[7] The porcupine is also known to be extremely hurtful to gardens; and, where it enters, does incredible damage.

The Americans, who hunt this animal, assure us, that the porcupine lives from twelve to fifteen years. During the time of coupling, which is in the month of September, the males become very fierce and dangerous, and often are seen to destroy each other with their teeth. The female goes with young seven months, and brings forth but one at a time; this she suckles but about a month, and accustoms it betimes to live like herself, upon vegetables and the bark of trees: she is very fierce in its defence; but, at other seasons, she is fearful, timid, and harmless. The porcupine never attempts to bite, nor any way to injure its pursuers: if hunted by a dog or a wolf, it instantly climbs up a tree, and continues there until it has wearied out the patience of its adversary; the wolf knows, by experience, how fruitless it would be to wait; he therefore leaves the porcupine above, and seeks out for a new adventure. The porcupine does not escape so well from the Indian hunter, who eagerly pursues it, in order to make embroidery of its quills, and to eat its flesh. This, as we are commonly told, is very tolerable eating: however, we may expect wretched provisions when the savages are to be our caterers, for they eat every thing that has life. But they are very ingenious with regard to their embroidery: if I understand the accounts rightly, they dye the quills of various colours, and then splitting them into slips, as we see in the making of a cane chair, they embroider with these their belts, baskets, and several other necessary pieces of furniture.

As to the rest, there are many things related concerning this animal that are fabulous; but there are still many circumstances more, that yet remain to be known. It were curious to inquire whether this animal moults its quills when wild, for it is never seen to shed them in a domestic state; whether it sleeps all the winter, as we are told by some naturalists, which we are sure it does not when brought into our country; and, lastly, whether its quills can be sent off with a shake; for no less a naturalist than Reaumer was of that opinion.[8]

All that we can learn of an animal exposed as a show, or even by its dissection, is but merely its conformation; and that makes one of the least interesting parts of its history. We are naturally led, when presented with an extraordinary creature, to expect something extraordinary in its way of living, something uncommon and corresponding with its figure; but of this animal we know little with any precision, except what it offers in a state of captivity. In such a situation, that which I saw appeared to very little advantage: it was extremely dull and torpid, though very wakeful and extremely voracious, though very capable of sustaining hunger; as averse to any attachment, as to being tamed: it was kept in an iron cage, and the touching one of the bars was sufficient to excite its resentment, for its quills were instantly erected, and the poet was right in his epithet of *fretful;* for it appeared to me the most irascible creature upon earth.

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[5] M. de Vaillant in his Travels says, that owing to some pernicious quality in the quills, one of his Hottentots, who had received a wound in his leg from a porcupine, was ill for more than six months.—Ed.

[6] Bosman. Smith. L. P. Vincent Marie, &c.

[7] Buffon.

[8] Bewick, in his 'General History of Quadrupeds,' says, that upon the smallest irritation it raises its quills, and shakes them with great violence, directing them to that quarter from whence it is in danger of being attacked, and striking at the object of its resentment at the same time. "We have observed, on an occasion of this sort, at a time when the animal was moulting or casting its quills, that they would fly out to the distance of a few yards with such force as to bend the points of them against the board where they struck; and it is not improbable that a circumstance of this kind may have given rise to an opinion of its power to use them in a more effectual manner."—Ed.

The porcupines of America differ very much from that of the ancient continent, which we have been describing; and, strictly speaking, may be considered as animals of a different species: however, from their being covered with quills, we will only add them as varieties of the former, since we know very little concerning them, except their difference of figure. They are of two kinds; the one called the *couando;* and the other, first named by Mr. Buffon, the *urson;* the one a native of the northern parts of America, the other of the south; and both differing from the former in having long tails, whereas that has a very short one.

The couando is much less than the porcupine; its quills are four times shorter, its snout more unlike that of a hare; its tail is long enough to catch by the branches of trees, and hold by them. It may be easily tamed, and it is to be found chiefly in the southern parts of America; yet is not wanting also in the northern.

The urson, which Mr. Buffon calls after our countryman Hudson, is a native of Hudson's Bay. The make of the body of this animal is not so round as that of the two former, but somewhat resembling the shape of a pig. It is covered with long bristly hair, with a shorter hair underneath; and under this the quills lie concealed very thick; they are white, with a brown point, and bearded, and the longest do not exceed four inches; they stick to the hand when the animal is stroked on the back; and likewise, when the hand is taken away, they stick so fast as to follow it. They make their nest under the roots of great trees, sleep very much, and chiefly feed upon the bark of the juniper. In winter the snow serves them for drink; and in summer they lap water like a dog. They are very common in the country lying to the east of Hudson's Bay; and several of the trading Americans depend on them for food, at some seasons of the year.

CHAP. III.

QUADRUPEDS COVERED WITH SCALES OR SHELLS INSTEAD OF HAIR.[1]

When we talk of a quadruped, the name seems to imply an animal covered with hair; when we mention a bird, it is natural to conceive a creature covered with feathers; when we hear of a fish, its scales are generally the first part that strikes our imagination. Nature, however, owns none of our distinctions; various in all her operations, she mixes her plans, groups her pictures, and excites our wonder, as well by her general laws as by her deviations. Quadrupeds, which we have considered as making the first general class in animated nature, and, next to man, the most dignified tenants of the earth, are yet, in many respects, related to the classes beneath them, and do not in every respect preserve their usual distinctions. Their first character, which consists in having four feet, is common to the lizard kind as well as to them. The second prerogative, which is that of bringing forth living young, is found in the cetaceous tribe of fishes, and also in insects without number. Their third and last attribute, which seems more general and constant than the former, that of being covered with hair, is yet found in various other animals, and is deficient in quadrupeds themselves. Thus we must be cautious of judging of the nature of animals from one single character, which is always found incomplete; for it often happens that three or four of the most general characters will not suffice. It must be by a general enumeration of the parts that we can determine precisely of the works of the creation; and instead of definitions learn to describe. Had this method been followed, much of the disgust and the intricacy of history might have been avoided, and that time which is now employed in combating error, laid out in the promoting of science.

Were we to judge of nature from definitions only, we should never be induced to suppose that there existed races of viviparous quadrupeds destitute of hair, and furnished with scales and shells in their stead. However, nature, every way various, supplies us with many instances of these extraordinary creatures; the old world has its quadrupeds covered with scales, and the new with a shell. In both they resemble each other, as well in the strangeness of their appetites as in their awkward conformation. Like animals but partially made up, and partaking of different natures, they want those instincts which animals, formed but for one element alone, are found to possess. They seem to be a kind of strangers in nature, creatures taken from some other element, and capriciously thrown to find a precarious subsistence upon land.

THE PANGOLIN.

The pangolin, which has been usually called the *scaly lizard*, Mr. Buffon very judiciously restores to that denomination by which it is known in the countries where it is found. The calling it a lizard, he justly observes, might be apt to produce error, and occasion its being confounded with an animal which it resembles only in its general form and in its being covered with scales. The lizard may be considered as a reptile produced from an egg; the pangolin is a quadruped, and brought forth alive, and perfectly formed. The lizard is all over covered with the marks of scales; the pangolin has scales neither on the throat, the breast, nor the belly. The scales of the lizard seem stuck upon the body even closer than those of fishes; the scales of the pangolin are only fixed at one end, and capable of being erected, like those of the porcupine, at the will of the animal. The lizard is a defenceless creature; the pangolin can roll itself into a ball, like the hedgehog, and present the points of its scales to the enemy, which effectually defend it.

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[1] This chapter is chiefly extracted from Mr. Buffon, which I mention at once, to save the trouble of repeated quotation.

The pangolin, which is a native of the torrid climates of the ancient continent, is, of all other animals, the best protected from external injury by nature. It is about three or four feet long; or, taking in the tail, from six to eight. Like the lizard, it has a small head, a very long nose, a short thick neck, a long body, legs very short, and a tail extremely long, thick at the insertion, and terminating in a point. It has no teeth, but is armed with five toes on each foot, with long white claws. But what it is chiefly distinguished by, is its scaly covering, which, in some measure, hides all the proportions of its body. These scales defend the animal on all parts, except the under part of the head and neck, under the shoulders, the breast, the belly, and the inner side of the legs; all which parts are covered with a smooth, soft skin, without hair. Between the shells of this animal, at all the interstices, are seen hairs like bristles, brown at the extremity, and yellow towards the root. The scales of this extraordinary creature are of different sizes and different forms, and stuck upon the body somewhat like the leaves of an artichoke. The largest are found near the tail, which is covered with them like the rest of the body. These are above three inches broad, and about two inches long, thick in the middle and sharp at the edges, and terminated in a roundish point. They are extremely hard, and their substance resembles that of horn. They are convex on the outside, and a little concave on the inner; one edge sticks in the skin, while the other laps over that immediately behind it. Those that cover the tail, conform to the shape of that part, being of a dusky brown colour, and so hard, when the animal has acquired its full growth, as to turn a musket-ball.

Thus armed, this animal fears nothing from the efforts of all other creatures, except man. The instant it perceives the approach of an enemy, it rolls itself up like the hedgehog, and presents no part but the cutting edges of its scales to the assailant. Its long tail, which at first view might be thought easily separable, serves still more to increase the animal's security. This is lapped round the rest of the body, and, being defended with shells even more cutting than any other part, the creature continues in perfect security. Its shells are so large, so thick, and so pointed, that they repel every animal of prey; they make a coat of armour that wounds while it resists, and at once protects and threatens. The most cruel, the most famished quadruped of the forest, the tiger, the panther, and the hyæna, make vain attempts to force it. They tread upon, they roll it about, but all to no purpose; the pangolin remains safe within, while its invader almost always feels the reward of its rashness. The fox often destroys the hedgehog by pressing it with its weight, and thus obliges it to put forth its nose, which he instantly seizes, and soon after the whole body; but the scales of the pangolin effectually support it under any such weight, while nothing that the strongest animals are capable of doing can compel it to surrender. Man alone seems furnished with arms to conquer its obstinacy. The negroes of Africa, when they find it, beat it to death with clubs, and consider its flesh as a very great delicacy.

But although this animal be so formidable in its appearance, there cannot be a more harmless inoffensive creature when unmolested. It is even unqualified by nature to injure larger animals, if it had the disposition, for it has no teeth. It should seem that the bony matter, which goes in other animals to supply the teeth, is exhausted in this in supplying the scales that go to the covering of its body. However this be, its life seems correspondent to its peculiar conformation. Incapable of being carnivorous, since it has no teeth, nor of subsisting on vegetables, which require much chewing, it lives entirely upon insects, for which nature has fitted it in a very extraordinary manner. As it has a long nose, so it may naturally be supposed to have a long tongue; but, to increase its length still more, it is doubled in the mouth, so that when extended it is shot out to above a quarter of a yard beyond the tip of the nose. This tongue is round, extremely red, and covered with an unctuous and slimy liquor, which gives it a shining hue. When the pangolin, therefore, approaches an ant-hill, for these are the insects on which it chiefly feeds, it lies down near it, concealing as much as possible the place of its retreat, and stretching out its long tongue among the ants, keeps it for some time quite immoveable. These little animals, allured by its appearance, and the unctuous substance with which it is smeared, instantly gather upon it in great numbers; and when the pangolin supposes a sufficiency, it quickly withdraws the tongue, and swallows them at once. This peculiar manner of hunting for its prey is repeated either till it be satisfied, or till the ants, grown more cautious, will be allured to their destruction no longer. It is against these noxious insects, therefore, that its only force or cunning is exerted; and were the negroes but sufficiently sensible of its utility in destroying one of the greatest pests to their country, they would not be so eager to kill it. But it is the nature of savage men to pursue the immediate good, without being solicitous about the more distant benefit they remove. They, therefore, hunt this animal with the utmost avidity for its flesh; and, as it is slow and unable to escape in an open place, they seldom fail of destroying it. However, it chiefly keeps in the most obscure parts of the forest, and digs itself a retreat in the clefts of rocks, where it brings forth its young, so that it is but rarely met with, and continues a solitary species, and an extraordinary instance of the varying of Nature.

Of this animal, there is a variety which is called the PHATAGIN, much less than the former, being not above a foot long from the head to the tail, with shells differently formed, with its belly, breast, and throat covered with hair, instead of a smooth skin, as in the former: but that by which it is peculiarly distinguished, is the extent of its tail, which is above twice the length of its body. Both are found in the warm latitudes of the East, as well as in Africa; and, as their numbers are but few, it is to be supposed their fecundity is not great.

THE ARMIDILLO, OR TATOU.

Having mentioned quadrupeds of the ancient continent covered with scales, we come next to quadrupeds of the new continent covered with shells. It would seem that Nature had reserved all the wonders of her power for these remote and thinly inhabited countries, where the men are savage, and the quadrupeds various. It would seem that she becomes more extraordinary in proportion as she retires from human inspection. But the real fact is, that wherever mankind are polished, or thickly planted, they soon rid the earth of these odd and half-formed productions, that in some measure encumber the soil. They soon disappear in a cultivated country, and continue to exist only in those remote deserts where they have no enemies but such as they are enabled to oppose.

The armadillo is chiefly an inhabitant of South America; a peaceful, harmless creature, incapable of offending any other quadruped, and furnished with a peculiar covering for its own defence. The pangolin, described above, seems an inactive, helpless being, indebted for its safety more to its patience than its power; but the armadillo is still more exposed and helpless. The pangolin is furnished with an armour that wounds while it resists, and that is never attacked with impunity; but the armadillo is obliged to submit to every insult, without any power of repelling its enemy; it is attacked without danger, and is consequently liable to more various persecutions.

This animal being covered, like a tortoise, with a shell, or rather a number of shells, its other proportions are not easily discerned It appears, at first view, a round misshapen mass, with a long head, and a very large tail sticking out at either end, as if not of a piece with the rest of the body. It is of different sizes, from a foot, to three feet long, and covered with a shell divided into several pieces, that lap over each other like the plaits in a coat of armour, or in the tail of a lobster. The difference in the size of this animal, and also the different disposition and number of its plaits, have been considered as constituting so many species, each marked with its own particular name. In all, however, the animal is partially covered with this natural coat of mail; the conformation of which affords one of the most striking curiosities in natural history. This shell, which in every respect resembles a bony substance, covers the head, the neck, the back, the sides, the rump, and the tail to the very point. The only parts to which it does not extend, are the throat, the breast, and the belly, which are covered with a white soft skin, somewhat resembling that of a fowl stripped of its feathers. If these naked parts be observed with attention, they will be found covered with the rudiments of shells, of the same substance with those which cover the back. The skin, even in the parts which are softest, seems to have a tendency to ossify; but a complete ossification takes place only on those parts which have the least friction, and are the most exposed to the weather. The shell, which covers the upper part of the body, differs from that of the tortoise, in being composed of more pieces than one, which lie in bands over the body, and, as in the tail of the lobster, slide over each other, and are connected by a yellow membrane in the same manner. By this means the animal has a motion in its back, and the armour gives way to its necessary inflexions. These bands are of various numbers and sizes, and from them these animals have been distinguished into various kinds. In general, however, there are two large pieces that cover, one the shoulders, and the other the rump. In the back, between these, the bands are placed in different numbers, that lap over each other, and give play to the whole. Besides their opening cross-ways, they also open down along the back, so that the animal can move in every direction. In some there are but three of these bands between the large pieces; in others there are six; in a third kind there are eight; in a fourth kind, nine; in a fifth kind, twelve; and, lastly, in the sixth kind there is but one large piece, which covers the shoulders, and the rest of the body is covered with bands all down to the tail. These shells are differently coloured in different kinds, but most usually they are of a dirty gray. This colour, in all, arises from another peculiar circumstance in their conformation, for the shell itself is covered with a softish skin, which is smooth and transparent.

But, although these shells might easily defend this animal from a feeble enemy, yet they could make but a slight resistance against a more powerful antagonist; nature, therefore, has given the armadillo the same method of protecting itself with the hedgehog or the pangolin. The instant it perceives itself attacked, it withdraws its head under its shells, and lets nothing be seen but the tip of the nose; if the danger increases, the animal's precautions increase in proportion; it then tucks up its feet under its belly, unites its two extremities together, while the tail seems as a band to strengthen the connexion; and it thus becomes like a ball, a little flattish on each side. In this position it continues obstinately fixed, while the danger is near, and often long after it is over. In this situation it is tossed about at the pleasure of every other quadruped, and very little resembling a creature endowed with life and motion. Whenever the Indians take it, which is in this form, by laying it close to the fire, they soon oblige the poor animal to unfold itself, and to face a milder death to escape a more severe.

This animal is a native only of America, for they were utterly unknown before the discovery of that continent. It is an inoffensive harmless creature, unless it finds the way into a garden, where it does a great deal of mischief, by eating the melons, the potatoes, and other vegetables. Although a native of the warmest parts of America, yet it bears the cold of our climate without any inconvenience. We have often seen them shown among other wild beasts, which is a proof they are not difficult to be brought over. Their motion seems to be a swift walk, but they can neither run, leap, nor climb trees; so that, if found in an open place, they have no method of escaping from their pursuers. Their only resource in such an extremity is to make towards their hole as fast as they can; or, if this be impracticable, to make a new hole before the enemy arrives. For this they require but a very few moments' advantage; the mole itself does not burrow swifter than they can. For this purpose, they are furnished with claws extremely large, strong, and crooked, and usually four upon each foot. They are sometimes caught by the tail as they are making their way into the earth; but such is their resistance, and so difficult it is to draw them backward, that they leave their tail in the hand of their pursuer, and are very well contented to save their lives with its loss. The pursuers, sensible of this, never drag the tail with all their force, but hold it while another digs the ground about them; and thus these animals are taken alive. The instant the armadillo perceives itself in the power of its enemies, it has but one last resource, to roll itself up, and thus patiently wait whatever tortures they think proper to inflict. The flesh of the smaller kinds is said to be delicate eating; so that we may suppose they receive no mercy. For this reason, they are pursued with unceasing industry; and, although they burrow very deep in the earth, there have been many expedients used to force them out. The hunters sometimes contrive to fill the hole with smoke, which is often successful; they at other times force it by pouring in water. They also bring up a small kind of dogs to the chase that quickly overtake them, if at any distance from their burrow, and oblige them to roll themselves up in a ball, in which figure the hunters carry them home. If, however, the armadillo be near a precipice, it often escapes by rolling itself up, and then tumbling down from rock to rock, without the least danger or inconvenience. They are sometimes taken in snares laid for them by the sides of rivers and low moist places, which they particularly frequent; and this method, in general, succeeds better than any of the former, as their burrows are very deep, and they seldom stir out except in the night. At no time are they found at any great distance from their retreats, so that it requires some patience and skill to intercept their retreat.

There are scarcely any of these that do not root the ground like a hog, in search of such roots as make a principal part of their food. They live also upon melons and other succulent vegetables, and all will eat flesh when they can get it. They frequent water and watery places, where they feed upon worms, small fish, and water insects. It is pretended that there is a kind of friendship between them and the rattle-snake, that they live peaceably and commodiously together, and are frequently found in the same hole. This, however, may be a friendship of necessity to the armadillo; the rattle-snake takes possession of its retreats, which neither are willing to quit, while each is incapable of injuring the other.

As to the rest, these animals, though they all resemble each other in the general character of being clothed with a shell, yet differ a good deal in their size, and in the parts into which their shell is divided. The first of this kind, which has but three bands between the two large pieces that cover the back, is called the TATU APARA. I will not enter into an exact description of its figure, which, how well written soever, no imagination could exactly conceive; and the reader would be more fatigued to understand, than I to write it. The tail is shorter in this than any other kind, being not more than two inches long, while the shell, taking all the pieces together, is a foot long, and eight inches broad. The second is the TATOU of Ray, or the ENCOUBERT of Buffon: this is distinguished from the rest by six bands across the back; it is about the size of a pig of a month old, with a small long head and a very long tail. The third is the TATUETTE, furnished with eight bands, and not by a great deal so big as the former. Its tail is longer also, and its legs shorter in proportion. Its body from the nose to the insertion of the tail, is about ten inches long, and the tail seven. The fourth is the PIG-HEADED ARMADILLO, with nine bands. This is much larger than the former, being about two feet long from the nose to the tail. The fifth is the KABASSOU, or CATAPHRACTUS, with twelve bands, and still bigger than the former, or any other of its kind. This is often found above three feet long; but is never eaten as the rest are. The sixth is the WEASEL-HEADED ARMADILLO, with eighteen bands, with a large piece before, and nothing but bands backward. This is above a foot long, and the tail five inches. Of all these, the kabassou and the encoubert are the largest; the rest are of a much smaller kind. In the larger kinds, the shell is much more solid than in the others, and the flesh is much harder and unfit for the table. These are generally seen to reside in dry upland grounds, while the small species are always found in moist places, and in the neighbourhood of brooks and rivers. They all roll themselves into a ball; but those whose bands are fewest in number, are least capable of covering themselves up completely. The tatu apara, for instance, when rolled up, presents two great interstices between its bands, by which it is very easily vulnerable, even by the feeblest of quadrupeds.

CHAP. IV.

ANIMALS OF THE BAT KIND.

HAVING in the last chapter described a race of animals that unite the boundaries between quadrupeds and insects, I come in this to a very different class, that serve to fill up the chasm between quadrupeds and birds. Some naturalists, indeed, have found animals of the bat kind so much partaking of the nature of both, that they have been at a loss in which rank to place them, and have doubted, in giving the history of the bat, whether it was a beast or a bird they were describing. These doubts, however, no longer exist; they are now universally made to take their place among quadrupeds, to which their bringing forth their young alive, their hair, their teeth, as well as the rest of their habitudes and conformation, evidently entitle them. Pliny, Gesner, and Aldrovandus, who placed them among birds, did not consider that they wanted every character of that order of animals, except the power of flying. Indeed, when this animal is seen with an awkward and struggling motion supporting itself in the air at the dusk of the evening, it presents in some measure the appearance of a bird; but naturalists, whose business it is to examine it more closely, to watch its habitudes, and inspect into its formation, are inexcusable for concurring in the mistake.

The bat in scarcely any particular resembles the bird, except in its power of sustaining itself in the air. It brings forth its young alive; it suckles them; its mouth is furnished with teeth; its lungs are formed like those of quadrupeds; its intestines and its skeleton have a complete resemblance, and even are, in some measure, seen to resemble those of mankind.[1]

The bat most common in England, is about the size of a mouse; or nearly two inches and a half long. The membranes that are usually called wings, are, properly speaking, an extension of the skin all around the body, except the head, which, when the animal flies, is kept stretched on every side by the four interior toes of the fore-feet, which are enormously long, and serve like masts that keep the canvass of a sail spread, and regulate its motions.[2] The first toe is quite loose, and serves as a heel when the bat walks: or as a hook when it would adhere to any thing. The hind-feet are disengaged from the surrounding skin, and divided into five toes, somewhat resembling those of a mouse. The skin by which it flies is of a dusky colour. The body is covered with a short fur of a mouse colour, tinged with red. The eyes are very small; the ears like those of a mouse.

This species of the bat is very common in England. It makes its first appearance early in summer, and begins its flight in the dusk of the evening. It principally frequents the sides of woods, glades, and shady walks; and is frequently observed to skim along the surface of pieces of water. It pursues gnats, moths, and nocturnal insects of every kind. It feeds upon these; but will not refuse meat wherever it can find it. Its flight is a laborious irregular movement; and if it happens to be interrupted in its course, it cannot readily prepare for a second elevation; so that if it strikes against any object, and falls to the ground, it is usually taken.[3] It appears only in the most pleasant evenings, when its prey is generally abroad, and flies in pursuit with its mouth open. At other times it continues in its retreat; the chink of a ruined building, or the hollow of a tree. Thus this little animal, even in summer, sleeps the greater part of its time, never venturing out by day-light, nor in rainy weather; never hunting in quest of prey, but for a small part of the night, and then returning to its hole. But its short life is still more abridged by continuing in a torpid state during the winter. At the approach of the cold season, the bat prepares for its state of lifeless inactivity, and seems rather to choose a place where it may continue safe from interruption, than where it may be warmly or conveniently lodged. For this reason it is usually seen hanging by its hooked claws to the roofs of caves,

[1] Penis propendens.

[2] British Zoology.

[3] Mr. White, in his Natural History of Selborne, giving an account of a tame bat, says, "I saw it several times confute the vulgar opinion that bats, when down on a flat surface, cannot get on the wing again, by rising with great ease from the floor."—ED.

regardless of the eternal damps that surround it. The bat seems the only animal that will venture to remain in these frightful subterranean abodes, where it continues in a torpid state, unaffected by every change of the weather. Such of this kind as are not provident enough to procure themselves a deep retreat, where the cold and heat seldom vary, are sometimes exposed to great inconveniences, for the weather often becomes so mild in the midst of winter, as to warm them prematurely into life, and to allure them from their holes in quest of food, when nature has not provided a supply. These, therefore, have seldom strength to return; but having exhausted themselves in a vain pursuit after insects which are not to be found, are destroyed by the owl, or any other animal that follows such petty prey.

The bat couples and brings forth in summer, generally from two to five at a time: of this I am certain, that I have found five young ones in a hole together; but whether they were the issue of one parent, I cannot tell. The female has but two nipples, and those forward on the breast as in the human kind. This was a sufficient motive for Linnæus to give it the title of a *primus*, to rank it in the same order with mankind, and to push this contemptible animal among the chiefs of the creation. Such arbitrary associations produce rather ridicule than instruction, and render even method contemptible; however, we are to forgive too strong an attachment to system in this able naturalist, since his application to the particular history of the animal counterbalances the defect.[4]

From Linnæus we learn, that the female makes no nest for her young, as most birds and quadrupeds are known to do. She is barely content with the first hole she meets, where sticking herself by her hooks against the sides of her apartment, she permits her young to hang at the nipple, and in this manner to continue for the first or second day. When, after some time, the dam begins to grow hungry, and finds a necessity of stirring abroad, she takes her little ones and sticks them to the wall, in the manner she before hung herself; there they immoveably cling and patiently wait till her return.

Thus far this animal seems closely allied to the quadruped race. Its similitude to that of birds is less striking. As nature has furnished birds with extremely strong pectoral muscles to move the wings, and direct their flight, so has it also furnished this animal. As birds also have their legs weak, and unfit for the purposes of motion, the bat has its legs fashioned in the same manner, and is never seen to walk, or, more properly speaking, to push itself forward with its hind-legs, but in cases of extreme necessity. The toes of the fore-legs, or, if we may use the expression, its extremely long fingers, extend the web like a membrane that lies between them; and this, which is extremely thin, serves to lift the little body into the air: in this manner, by an unceasing percussion, much swifter than that of birds, the animal continues, and directs its flight; however, the great labour required in flying, soon fatigues it; for, unlike birds, which continue for days together upon the wing, the bat is tired in less than an hour, and then returns to its hole, satisfied with its supply, to enjoy the darkness of its retreat.

If we consider the bat as it is seen in our own country, we shall find it a harmless inoffensive creature. It is true that it now and then steals into a larder, and, like a mouse, commits its petty thefts upon the fattest parts of the bacon. But this happens seldom; the general tenor of its industry is employed in pursuing insects that are much more noxious to us than itself can possibly be: while its evening flight, and its unsteady wabbling motion, amuse the imagination, and add one figure more to the pleasing group of animated nature.

The varieties of this animal, especially in our country, are but few; and the differences scarcely worth enumeration. Naturalists mention the Long-eared Bat, much less than that generally seen, and with much longer ears; the Horse-shoe Bat, with an odd protuberance round its upper lip, somewhat in the form of a horse-shoe; the Rhinoceros Bat, with a horn growing from the nose, somewhat similar to that animal from whence it has the name. These, with several others, whose varieties are too numerous, and differences too minute for a detail, are all inoffensive, minute, and contemptible; incapable, from their size, of injuring mankind, and not sufficiently numerous much to incommode him. But there is a larger race of bats, found in the East and West Indies, that are truly formidable; each of these is singly a dangerous enemy, but when they unite in flocks they then become dreadful. Were the inhabitants of the African coasts,[5] says Des Marchais, to eat animals of the bat kind, as they do in the East Indies, they would never want a supply of provisions. They are there in such numbers, that, when they fly, they obscure the setting sun. In the morning, at peep of day, they are seen sticking upon the tops of the trees, and clinging to each other, like bees when they swarm, or like large clusters of cocoa. The Europeans often amuse themselves with shooting among this huge mass of living creatures, and observing their embarrassment when wounded. They sometimes enter the houses, and the negroes are expert at killing them; but although these people seem for ever hungry, yet they regard the bat with horror, and will not eat it though ready to starve.

Of foreign bats, the largest we have any certain accounts of, is the Rousette, or the Great Bat of Madagascar. This formidable creature is near

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[4] Fauna Suecica, p. 8.

[5] Des Marchais, vol. ii. p. 208.

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four feet broad, when the wings are extended; and a foot long, from the tip of the nose to the insertion of the tail. It resembles our bat in the form of its wings, in its manner of flying, and in its internal conformation. It differs from it in its enormous size; in its colour, which is red, like that of a fox; in its head and nose also, which resemble those of that animal, and which have induced some to call it the flying fox; it differs also in the number of its teeth; and in having a claw on the fore-foot, which is wanting in ours. This formidable creature is found only in the ancient continent; particularly in Madagascar, along the coasts of Africa and Malabar, where it is usually seen about the size of a large hen. When they repose, they stick themselves to the tops of the tallest trees, and hang with their heads downward. But when they are in motion, nothing can be more formidable; they are seen in clouds, darkening the air, as well by day as by night, destroying the ripe fruits of the country, and sometimes settling upon animals, and man himself; they devour, indiscriminately, fruits, flesh, and insects, and drink the juice of the palm-tree; they are heard at night in the forests at more than two miles distance, with a horrible din, but at the approach of day they usually begin to retire: nothing is safe from their depredations; they destroy fowls and domestic animals unless preserved with the utmost care, and often fasten upon the inhabitants themselves, attack them in the face, and inflict very terrible wounds. In short, as some have already observed, the ancients seem to have taken their ideas of harpies from these fierce and voracious creatures, as they both concur in many parts of the description, being equally deformed, greedy, uncleanly, and cruel.

An animal not so formidable, but still more mischievous than these, is the American vampyre. This is less than the former, but more deformed, and still more numerous. It is furnished with a horn like the rhinoceros bat; and its ears are extremely long. The other kinds generally resort to the forest, and the most deserted places; but these come into towns and cities, and, after sunset, when they begin to fly, cover the streets like a canopy.[6] They are the common pest both of men and animals; they effectually destroy the one, and often distress the other. "They are," says Ulloa, "the most expert blood-letters in the world. The inhabitants of those warm latitudes being obliged, by the excessive heats, to leave open the doors and windows of the chambers where they sleep, the vampyres enter, and if they find any part of the body exposed, they never fail to fasten upon it. There they continue to suck the blood; and it often happens that the person dies under the operation. They insinuate their tooth into a vein, with all the art of the most experienced surgeon, continuing to exhaust the body until they are satiated. I have been assured," continues he, "by persons of the strictest veracity, that such an accident has happened to them; and that had they not providentially awaked, their sleep would have been their passage into eternity; having lost so large a quantity of blood as hardly to find strength to bind up the orifice. The reason why the puncture is not felt, is, besides the great precaution with which it is made, the gentle refreshing agitation of the bat's wings, which contributes to increase sleep, and soften the pain."

The purport of this account has been confirmed by various other travellers; who all agree that this bat is possessed of a faculty of drawing the blood from persons sleeping; and thus often destroying them before they awake. But still a very strong difficulty remains to be accounted for; the manner in which they inflict the wound. Ulloa, as has been seen, supposes that it is done by a single tooth; but this we know to be impossible, since the animal cannot infix one tooth without all the rest accompanying its motions; the teeth of the bat kind being pretty even, and the mouth but small. Mr. Buffon, therefore supposes the wound to be inflicted by the tongue; which, however, appears to me too large to inflict an unpainful wound; and even less qualified for that purpose than the teeth. Nor can the tongue, as Mr. Buffon seems to suppose, serve for the purposes of suction, since for this it must be hollow, like a syringe, which it is not found to be.[7] I should therefore suppose, that the animal is endowed with a strong power of suction; and that, without inflicting any wound whatsoever, by continuing to draw, it enlarges the pores of the skin in such a manner, that the blood at length passes, and that more freely the longer the operation is continued; so that, at last, when the bat goes off, the blood continues to flow. In confirmation of this opinion we are told, that where beasts have a thick skin, this animal cannot injure them; whereas, in horses, mules, and asses, they are very liable to be thus destroyed. As to the rest, these animals are considered as one of the great pests of South America; and often prevent the peopling of many parts of that continent: having destroyed at Barja, and several other places, such cattle as were brought there by the missionaries, in order to form a settlement.

CHAP. V.

AMPHIBIOUS QUADRUPEDS.

THE gradations of nature, from one class of beings to another, are made by imperceptible deviations. As we saw in the foregoing chapters, quadrupeds almost degraded into the insect tribe, or mounted among the inhabitants of the air, we are at present to observe their approach to fishes, to trace the degrees by which they become more unlike terrestrial animals, till the similitude of the fish prevails over that of the quadruped.

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[6] Ulloa, vol. i. p. 58.

[7] A portion of the tongue has now been discovered to be exactly constituted as an organ of suction, which confirms the conjecture of Buffon.—ED.

As in opposite armies the two bodies are distinct and separated from each other, while yet between them are various troops that plunder on both sides, and are friends to neither; so between terrestrial and aquatic animals there are tribes that can scarcely be referred to any rank, but lead an amphibious life between them. Sometimes in water, sometimes on land, they seem fitted for each element, and yet completely adapted to neither. Wanting the agility of quadrupeds upon land, and the perseverance of fishes in the deep, the variety of their powers only seems to diminish their force; and, though possessed of two different methods of living, they are more inconveniently provided than such as have but one.

All quadrupeds of this kind, though covered with hair in the usual manner, are furnished with membranes between the toes, which assist their motion in the water. Their paws are broad, and their legs short, by which they are more completely fitted for swimming; for, taking short strokes at a time, they make them oftener and with greater rapidity. Some, however, of these animals are more adapted to live in the water than others; but, as their power increases to live in the deep, their unfitness for living upon land increases in the same proportion. Some, like the otter, resemble quadrupeds in every thing except in being in some measure web-footed; others depart still further, in being, like the beaver, not only web-footed, but have the tail covered with scales, like those of a fish. Others depart yet farther, as the seal and the morse, by having the hind feet stuck to the body like fins; and others, as the lamentin, almost entirely resemble fishes, by having no hind feet whatsoever. Such are the gradations of the amphibious tribe. They all, however, get their living in the water, either by habit or conformation; they all continue a long time under water; they all consider that element as their proper abode; whenever pressed by danger, they fly to the water for security; and, when upon land, appear watchful, timorous, and unwieldy.

THE OTTER.[8]

In the first step of the progression from land to amphibious animals, we find the Otter, resembling those of the terrestrial kind in shape, hair, and internal conformation; resembling the aquatic tribes in its manner of living, and in having membranes between the toes to assist it in swimming. From this peculiar make of its feet, which are very short, it swims even faster than it runs, and can overtake fishes in their own element. The colour of this animal is brown; and is somewhat of the shape of an overgrown weasel, being long, slender, and soft-skinned. However, if we examine its figure in detail, we shall find it unlike any other animal hitherto described, and of such a shape as words can but weakly convey. Its usual length is about two feet from the tip of the nose to the insertion of the tail; the head and nose are broad and flat; the mouth bears some similitude to that of a fish; the neck is short, and equal in thickness to the head; the body long; the tail broad at the insertion, but tapering off to a point at the end; the eyes are very small, and placed nearer the nose than usual in quadrupeds. The legs are very short, but remarkably strong, broad, and muscular. The joints are articulated so loosely, that the animal is capable of turning them quite back, and bringing them on a line with the body, so as to perform the office of fins. Each foot is furnished with five toes, connected by strong broad webs like those of water-fowl. Thus nature, in every part, has had attention to the life of an animal whose food is fish, and whose haunts must necessarily be about water.

This voracious animal is never found but at the sides of lakes and rivers, but particularly the former, for it is seldom fond of fishing in a running stream, for the current of the water having more power upon it than the fishes it pursues, if it hunts against the stream, it swims too slow; and if with the stream, it overshoots its prey. However, when in rivers, it is always observed to swim against the stream, and to meet the fishes it preys upon, rather than to pursue them. In lakes it destroys much more than it devours, and is often seen to spoil a pond in the space of a few nights. But the damage they do by destroying fish is not so great as their tearing in pieces the nets of the fishers, which they infallibly do whenever they happen to be entangled. The instant they find themselves caught, they go to work with their teeth, and in a few minutes destroy nets of a very considerable value.

The otter has two different methods of fishing; the one by catching its prey from the bottom upward, the other by pursuing it into some little creek, and seizing it there. In the former case, as this animal has longer lungs than most other quadrupeds, upon taking in a quantity of air, it can remain for some minutes at the bottom; and whatever fish passes over at that time is certainly taken; for as the eyes of fish are placed so as not to see under them, the otter attacks them off their guard from below; and seizing them at once by the belly, drags them on shore, where it often leaves them untouched, to continue the pursuit for hours together. The other method is chiefly practised in lakes and ponds, where there is no current: the fish thus taken are rather of the smaller kind, for the great ones will never be driven out of deep water.

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[8] The otter differs in no respect from the weasel kind, except in having the feet webbed, and in living almost constantly in the water, from whence they chiefly derive their food, which is fish.—Ed.

In this manner the otter usually lives during the summer, being furnished with a supply much greater than its consumption; killing for its amusement, and infecting the edges of the lake with quantities of the dead fish, which it leaves there as trophies rather of its victory than its necessities. But in winter, when the lakes are frozen over, and the rivers pour with a rapid torrent, the otter is often greatly distressed for provisions, and is then obliged to live upon grass, weeds, and even the bark of trees. It then comes upon land, and, grown courageous from necessity, feeds upon terrestrial animals, rats, insects, and even sheep themselves. Nature, however, has given it the power of continuing a long time without food; and although, during that season, it is not rendered quite torpid, like the marmout, or the dormouse, yet it keeps much more within its retreat, which is usually the hollow of a bank, worn under by the water. There it often forms a kind of gallery, running for several yards along the edge of the water: so that when attacked at one end, it flies to the other, and often evades the fowler by plunging into the water at forty or fifty paces distance, while he expects to find it just before him.

We learn from Mr. Buffon, that this animal, in France, couples in winter, and brings forth in the beginning of spring. But it is certainly different with us, for its young are never found till the latter end of summer; and I have frequently, when a boy, discovered their retreats, and pursued them at that season. I am, therefore, more inclined to follow the account given us of this animal by Mr. Lots, of the Academy of Stockholm, who assures us that it couples about the middle of summer, and brings forth at the end of nine weeks, generally three or four at a time. This, as well as the generality of his other remarks on this subject, agrees so exactly with what I remember concerning it, that I will beg leave to take him for my guide, assuring the reader that, however extraordinary the account may seem, I know it to be certainly true.

In the rivers and the lakes frequented by the otter, the bottom is generally stony and uneven, with many trunks of trees, and long roots stretching underneath the water.[9] The shore also is hollow and scooped inward by the waves. These are the places the otter chiefly chooses for its retreat; and there is scarcely a stone which does not bear the mark of its residence, as upon them its excrements are always made. It is chiefly by this mark that its lurking-places are known, as well as by the quantity of dead fish that are found lying here and there upon the banks of the water. To take the old ones alive is no easy task, as they are extremely strong, and there are few dogs that will dare to encounter them. They bite with great fierceness, and never let go their hold when they have once fastened. The best way, therefore, is to shoot them at once, as they never will be thoroughly tamed; and, if kept for the purposes of fishing, are always apt to take the first opportunity of escaping. But the young ones may be more easily taken, and converted to very useful purposes. The otter brings forth its young generally under the hollow banks, upon a bed of rushes, flags, or such weeds as the place affords in the greatest quantities. I see in the British Zoology a description of its habitation, where that naturalist observes, "that it burrows under ground, on the banks of some river or lake, and always makes the entrance of its hole under water, then works up to the surface of the earth, and there makes a minute orifice for the admission of air; and this little airhole is often found in the middle of some thicket." In some places this may be true, but I have never observed any such contrivance; the retreat, indeed, was always at the edge of the water, but it was only sheltered by the impending bank, and the otter itself seemed to have but a small share in its formation. But, be this as it may, the young ones are always found at the edge of the water; and, if under the protection of the dam, she teaches them instantly to plunge, like herself, into the deep, and escape among the rushes or weeds that fringe the stream. At such times, therefore, it is very difficult to take them; for, though never so young, they swim with great rapidity, and in such a manner that no part of them is seen above water, except the tip of the nose. It is only when the dam is absent that they can be taken; and in some places there are dogs purposely trained for discovering their retreats. Whenever the dog comes to the place, he soon, by his barking, shows that the otter is there; which, if there be an old one, instantly plunges into the water, and the young all follow. But if the old one be absent, they continue terrified, and will not venture forth but under her guidance and protection. In this manner they are secured and taken home alive, where they are carefully fed with small fish and water. In proportion, however, as they gather strength, they have milk mixed among their food, the quantity of their fish provision is retrenched, and that of vegetables is increased, until at length they are fed wholly upon bread, which perfectly agrees with their constitution. The manner of training them up to hunt for fish requires not only assiduity but patience; however, their activity and use, when taught, greatly repays the trouble of teaching; and, perhaps, no other animal is more beneficial to his master. The usual way is, first to learn them to fetch as dogs are instructed; but, as they have not the same docility, so it requires more art and experience to teach them. It is usually performed by accustoming them to take a truss stuffed with wool, of the shape of a fish, and made of leather, in their mouths, and to drop it at the word of command; to run after it when thrown forward, and to bring it to their master. From this they proceed to real fish, which are thrown dead into the water, and which they are taught to fetch from thence. From the dead they proceed to the live, until at last the animal is perfectly instructed in the whole art of fishing. An otter thus taught is a very valuable animal, and will catch fish enough to sustain not only itself but a whole family. I have seen one of these go to a gentleman's pond at the word of command, drive up the fish into a corner, and, seizing upon the largest of the whole, bring it off in its mouth to its master.

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[9] Journal Etranger, Juin 1755, p. 14.

Otters are to be met with in most part of the world, and rather differ in size and colour from each other, than in habitudes or conformation.[10] In North America, and Carolina, they are usually found white, inclining to yellow. The Brasilian otter is much larger than ours, with a roundish head, almost like a cat. The tail is shorter, being but five inches long; and the hair is soft, short, and black, except on the head, where it is of a dark brown, with a yellowish spot under the throat.[11]

THE BEAVER.

In all countries, as man is civilized and improved, the lower ranks of animals are repressed and degraded.[12] Either reduced to servitude or treated as rebels, all their societies are dissolved, and all their united talents rendered ineffectual. Their feeble arts quickly disappear, and nothing remains but their solitary instincts, or those foreign habitudes which they receive from human education. For this reason there remain no traces of their ancient talents and industry, except in those countries where man himself is a stranger: where unvisited by his controlling power, for a long succession of ages, their little talents have had time to come to their limited perfection, and their common designs have been capable of being united.

The beaver seems to be now the only remaining monument of brutal society. From the result of its labours, which are still to be seen in the remote parts of America, we learn how far instinct can be aided by imitation. We from thence perceive to what a degree animals, without language or reason, can concur for their mutual advantage, and attain by numbers those advantages which each in a state of solitude seems unfitted to possess.

If we examine the beaver merely as an individual, and unconnected with others of its kind, we shall find many other quadrupeds to exceed it in cunning, and almost all in the powers of annoyance and defence. The beaver, when taken from its fellows, and kept in a state of solitude or domestic tameness, appears to be a mild gentle creature, familiar enough, but somewhat dull, and even melancholy; without any violent passions or vehement appetites, moving but seldom, making no efforts to attain any good, except in gnawing the wall of its prison, in order to regain its freedom; yet this, however, without anger or precipitation, but calm and indifferent to all about, without attachment or antipathies, neither seeking to offend nor desiring to please.

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[10] Ray.

[11] The whole length of the sea-otter is generally about four feet, of which the tail occupies thirteen inches. The fur is extremely soft, and of a deep glossy black. The ears are small and erect, and the whiskers long and white. The legs are short and thick, the hinder ones somewhat resembling those of a seal. The weight of the largest sea-otters is from seventy to eighty pounds. In their general habits of life these animals are perfectly harmless and inoffensive; and towards their offspring they exhibit a degree of attachment which is extremely interesting. They will never desert them; they will even starve themselves to death on being robbed of them, and strive to breathe their last on the spot where their young have been destroyed. The female produces only a single young one at a time, which she suckles almost a whole year, and till it takes to itself a mate. The sea-otters pair, and are very constant. They often carry their young between their teeth, and fondle them, frequently throwing them up, and catching them again in their paws. Before these can swim, the old ones will take them in their fore-feet, and swim about with them on their backs. The sea-otters swim sometimes on their sides; at other times on their backs, or in an upright position. They are very sportive, embrace each other, and seem to kiss. When attacked they make no resistance, but endeavour to save themselves by flight: if, however, they are closely pressed, and can see no means of escape, they scold and grin like an angry cat. On receiving a blow, they immediately lie on their side, draw up their hind legs together, cover their eyes with their fore-paws, and thus seem to prepare for death. But if they are fortunate enough to escape their pursuer, they deride him as soon as they are safe in the sea, with various diverting tricks; at one time keeping themselves on end in the water, and jumping over the waves, holding the fore-paw over the eyes, as if to shade them from the sun while looking out for their enemy; then lying flat on their back, and stroking their belly; then throwing their young down into the water, and fetching them up again. In their escape they carry the sucklings in their mouths, and drive before them those that are full-grown. The skins of the sea-otters are of great value, and have long formed a considerable export from Russia. They are disposed of to the Chinese at the rate of eighty or a hundred rubles each.—The trade for this fur at Nootka had, not many years ago, nearly produced a war between Great Britain and Spain. These animals are found on the coast of Kamtschatka, and in the adjacent islands, as well as on the opposite coasts of America; but they are confined within a very few degrees of latitude.

The Cayenne otter has the toes on the fore-feet unconnected; the tail, long, taper, and naked. It is about seven inches in length. The body with large brownish-black spots; it is of a yellowish gray colour between; the under parts are white; over each eye is a white spot; the ears are large and round; the mouth is whiskered; the tail is round above, flat beneath, and of a whitish colour at the tip. It is covered with a rough granulated skin.—ED.

[12] Buffon.

It appears inferior to the dog in those qualities which render animals of service to man; it seems made neither to serve, to command, nor to have connexions with any other set of beings, and is only adapted for living among its kind. Its talents are entirely repressed in solitude, and are only brought out by society. When alone, it has but little industry, few tricks, and without cunning sufficient to guard it against the most obvious and bungling snares laid for it by the hunter. Far from attacking any other animal, it is scarcely possessed of the arts of defence. Preferring flight to combat, like all wild animals, it only resists when driven to an extremity, and fights only when its speed can no longer avail.

But this animal is rather more remarkable for the singularity of its conformation, than any intellectual superiorities it may be supposed, in a state of solitude, to possess. The beaver is the only creature among quadrupeds that has a flat broad tail covered with scales, which serves as a rudder to direct its motions in the water. It is the sole quadruped that has membranes between the toes on the hind feet only, and none on the fore-feet, which supply the place of hands, as in the squirrel. In short, it is the only animal that in its fore-parts entirely resembles a quadruped, and in its hinder parts seems to approach the nature of fishes, by having a scaly tail. In other respects, it is about two feet long, and near one foot high; it is somewhat shaped like a rat, except the tail, which, as has been observed, is flat and scaly, somewhat resembling a neat's tongue at the point. Its colour is of a light brown; the hair of two sorts; the one longer and coarser, the other soft, fine, short, and silky. The teeth are like those of a rat or a squirrel, but longer and stronger, and admirably adapted to cutting timber or stripping bark, to which purposes they are constantly applied. One singularity more may be mentioned in its conformation; which is, that, like birds, it has but one and the same vent for the emission of its excrements and its urine; a strange peculiarity, but which anatomists leave us no room to doubt of.

The beavers begin to assemble about the months of June and July, to form a society that is to continue for the greatest part of the year. They arrive in numbers from every side, and generally form a company of above two hundred. The place of meeting is commonly the place where they fix their abode, and this is always by the side of some lake or river. If it be a lake, in which the waters are always upon a level, they dispense with building a dam; but if it be a running stream, which is subject to floods and falls, they then set about building a dam, or pier, that crosses the river, so that it forms a dead water in that part which lies above and below. This dam, or pier, is often fourscore or a hundred feet long, and ten or twelve feet thick at the base. If we compare the greatness of the work with the powers of the architect, it will appear enormous; but the solidity with which it is built is still more astonishing than its size. The part of the river over which this dam is usually built, is where it is most shallow, and where some great tree is found growing by the side of the stream. This they pitch upon as proper for making the principal part in their building; and, although it is often thicker than a man's body, they instantly set about cutting it down. For this operation they have no other instrument but their teeth, which soon lay it level, and that also on the side they wish it to fall, which is always across the stream. They then fall about cutting off the top branches, to make it lie close and even, and serve as the principal beam of their fabric.[13]

This dike, or causey, is sometimes ten, and sometimes twelve feet thick, at the foundation.

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[13] Spectacle de la Nature.—A correspondent of the 'Penny Magazine,' in 1840, says of the beaver, "These animals commonly congregate in parties, sometimes amounting to a score or two, and sometimes even to hundreds. But this is not the case invariably, for in the forests of America they are occasionally found in solitary pairs. When this is the case their fur is not considered equal to that of the community beaver, although they appear to be of the same species. From the opinions I have been able to form during a long sojourn in various parts of the American continent, which once were favourite haunts of the beaver, but from most of which they have been scared away, as well as from the opinions of other individuals, whose opportunities of coming to a correct judgment have even exceeded my own—there seems little doubt but the accounts of their making such perfect, and, I may almost say, scientific dams across streams and rivers, have been painted in imaginative colours; as have, also, those relations connected with the building of their habitations when living in numerous societies. Admitting that they possess all the sagacity that Buffon or any other writer on natural history has thought fit to assign to them, it is quite impossible that they should perform works of that magnitude, and where so much strength or power was absolutely necessary, as we have been informed was the case. In some parts of the country, indeed in almost every part of it where the surface is somewhat hilly or broken, those swampy pieces of ground universally called beaver-meadows are found in the American forests. In many places I have seen them occupying nearly every little hollow or valley between the various headlands of branch brooks and streams; so that if they have ever really been, as is generally believed, the abodes of colonies of beavers at some past and remote period, we may reasonably conclude that, in those situations so peculiarly adapted for the haunts of these animals, their numbers must have been very considerable indeed when these meadows were inhabited by them. From the hilly districts bordering upon the river and gulf of St. Lawrence westward through New Brunswick and all the upland country, from thence through all that section of the United States until we reach the great valley of the Mississippi, beaver-meadows are more or less numerous; although through all this vast range of country, a great portion of which has become peopled by the human race, at the present day but very few beavers are found. Most of them have undoubtedly been destroyed; but in some cases they have sought for safety in the yet unreclaimed forest, constantly receding at the approach of man."—Ed.

It descends in a declivity, or slope, on that side next the water, which gravitates upon the work in proportion to the height, and presses it with a prodigious force towards the earth. The opposite side is erected perpendicular, like our walls; and that declivity, which, at the bottom, or basis, is about twelve feet broad, diminishes towards the top, and where it is no more than two feet broad, or thereabouts. The materials whereof this mole consists, are wood and clay. The beavers cut, with surprising ease, large pieces of wood, some as thick as one's arm or thigh, and about four, five, or six feet in length, or sometimes more, according as the slope ascends. They drive one end of these stakes into the ground, at a small distance one from the other, intermingling a few with them that are smaller and more pliant. As the water however, would find a passage through the intervals or spaces between them, and leave the reservoir dry, they have recourse to a clay, which they know where to find, and with which they stop up all the cavities both within and without, so that the water is duly confined. They continue to raise the dike in proportion to the elevation of the water, and the plenty which they have of it. They are conscious, likewise, that the conveyance of their materials by land would not be so easily accomplished as by water; and therefore they take the advantage of its increase, and swim with their mortar on their tails, and their stakes between their teeth, to the place where there is most occasion for them. If their works are, either by the force of the water, or the feet of the huntsmen who run over them, in the least damnified, the breach is instantly made up; every nook and corner of the habitation is reviewed, and, with the utmost diligence and application, perfectly repaired. But when they find that the huntsmen visit them too often, they work only in the night-time, or else abandon their works entirely, and seek out for some safer situation.

The dike or mole, being thus completed, their next care is to erect their several apartments, which are either round or oval, and divided into three stories, one raised above the other: the first below the level of the causey, which is for the most part full of water; the other two above it. This little fabric is built in a very firm and substantial manner, on the edge of their reservoir, and always in such divisions or apartments as above mentioned; that in case of the water's increase, they may move up a story higher, and be no ways incommoded. If they find any little island contiguous to their reservoir, they fix their mansion there, which is then more solid, and not so frequently exposed to the overflowing of the water, in which they are not able to continue for any length of time. In case they cannot pitch upon so commodious a situation, they drive piles into the earth, in order to fence and fortify their habitation against the wind as well as the water. They make two apertures, at the bottom, to the stream; one is a passage to their bagnio, which they always keep neat and clean; the other leads to that part of the building where everything is conveyed that will either soil or damage their upper apartments. They have a third opening, or doorway, much higher, contrived for the prevention of their being shut up and confined, when the frost and snow has closed the apertures of the lower floors. Sometimes they build their houses altogether upon dry land; but then they sink trenches five or six feet deep, in order to descend into the water when they see convenient. They make use of the same materials; and are equally industrious in the erection of their lodges as their dikes. Their walls are perpendicular, and about two feet thick. As their teeth are more serviceable than saws, they cut off all the wood that projects beyond the wall. After this, when they have mixed up some clay and dry grass together, they work it into a kind of mortar, with which, by the help of their tails, they plaster all their works, both within and without.

The inside is vaulted, and is large enough for the reception of eight or ten beavers. In case it rises in an oval figure, it is for the generality above twelve feet long, and eight or ten feet broad. If the number of inhabitants increase to fifteen, twenty, or thirty, the edifice is enlarged in proportion. I have been credibly informed, that four hundred beavers have been discovered to reside in one large mansion-house, divided into a vast number of apartments, that had a free communication one with another.

All these works, more especially in the northern parts, are finished in August, or September at the farthest; at which time they begin to lay in their stores. During the summer they are perfect epicures; and regale themselves every day on the choicest fruits and plants the country affords. Their provisions, indeed, in the winter season, principally consist of the wood of the birch, the plane, and some few other trees, which they steep in water from time to time, in such quantities as are proportioned to the number of inhabitants. They cut down branches from three to ten feet in length. Those of the largest dimensions are conveyed to the magazines by a whole body of beavers; but the smallest by one only: each of them, however, takes a different way, and has his proper walk assigned him, in order that no one labourer should interrupt another in the prosecution of his work. Their wood-yards are larger or smaller in proportion to the number in the family; and according to the observation of some curious naturalists, the usual stock of timber, for the accommodation of ten beavers, consists of about thirty feet in a square surface, and ten in depth. These logs are not thrown up in one continued pile, but laid one across the other, with intervals or small spaces between them in order to take out, with the greater facility, but just such a quantity as they shall want for their immediate consumption, and those parcels only, which lie at the bottom in the water and have been duly steeped. This timber is cut again into small particles, and conveyed to one of their largest lodges, where the whole family meet, to consume their respective dividends, which are made impartially, in even and equal portions. Sometimes they traverse the woods and regale their young with a more novel and elegant entertainment.

Such as are used to hunt these animals, know perfectly well that green wood is much more acceptable to them than that which is old and dry; for which reason they plant a considerable quantity of it round their lodgments; and as they come out to partake of it, they either catch them in snares, or take them by surprise. In the winter, when the frosts are very severe, they sometimes break a large hole in the ice; and when the beavers resort thither for the benefit of a little fresh air, they either kill them with their hatchets, or cover the opening with a large substantial net. After this, they undermine and subvert the whole fabric; whereupon the beavers, in hopes to make their escape in the usual way, fly with the utmost precipitation to the water; and plunging into the aperture, fall directly into the net and are inevitably taken.[14]

THE SEAL.

Every step we proceed in the description of amphibious quadrupeds, we make nearer advances to the tribe of fishes. We first observed the otter, with its feet webbed and formed for an aquatic life; we next saw the beaver, with the hinder parts covered with scales, resembling those of fishes; and we now come to a class of animals in which the shape and habits of fishes still more apparently prevail, and whose internal conformation attaches them very closely to the water. The seal, in general, resembles a quadruped in some respects, and a fish in others. The head is round like that of a man; the nose broad like that of the otter; the teeth like those of a dog; the eyes large and sparkling; no external ears, but holes that serve for that purpose; the neck is well proportioned and of a moderate length; but the body thickest where the neck is joined to it. From thence the animal tapers down to the tail, growing all the way smaller like a fish. The whole body is covered with a thick bristly shining hair, which looks as if it were entirely rubbed over with oil; and thus far the quadruped prevails over the aquatic. But it is in the feet that this animal greatly differs from all the rest of the quadruped kind; for though furnished with the same number of bones with other quadrupeds, yet they are so stuck on the body, and so covered with a membrane, that they more resemble fins than feet; and might be taken for such, did not the claws with which they are pointed show their proper analogy. In the fore-feet or rather hands, all the arm and the cubit are hid under the skin, and nothing appears but the hand from the wrist downwards; so that if we imagine a child with its arms swathed down, and nothing appearing but its hands at each side of the body, towards the breast, we may have some idea of the formation of this animal in that part. These hands are covered in a thick skin, which serves like a fin for swimming; and are distinguished by five claws, which are long, black, and piercing. As to the hind-feet, they are stretched out on each side of the short tail, covered with a hairy skin like the former, and both together, almost joining at the tail; the whole looks like the broad flat tail of a fish; and were it not for five claws which appear, might be considered as such. The dimensions of this animal are various, being found from four feet long to nine. They differ also in their colours; some being black, others spotted, some white, and many more yellow. It would therefore be almost endless to mention the varieties of this animal. Buffon describes three and Krantz mentions five, all different from those described by the other. I might, were I fond of such honours, claim the merit of being a first describer myself; but, in fact, the varieties of this animal are so many, that were they all described, the catalogue would be as extensive as it would be useless and unentertaining.[15] It is sufficient to observe, that they agree in the general external characters already mentioned, and internally in two or three more, which are so remarkable as to deserve peculiar attention.

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[14] "Practice," says Captain Bonneville, "has given such a quickness of eye to the experienced trapper in all that relates to his pursuit, that he can detect the slightest sign of a beaver, however wild; and, although the lodge may be concealed by close thickets and overhanging willows, he can generally at a single glance make an accurate guess at the number of its inmates. He now goes to work to set his trap, planting it upon the shore in some chosen place, two or three inches below the surface of the water, and secures it by a chain to a pole set deep in the mud. A small twig is then stripped of its bark, and one end is dipped in the 'medicine,' as the trappers term the peculiar bait which they employ. This end of the stick rises about four inches above the surface of the water, the other end is planted between the jaws of the trap. The beaver, possessing an acute sense of smell, is soon attracted by the odour of the bait. As he raises his nose towards it, his foot is caught in the trap. In his fright he throws a somerset into the deep water. The trap being fastened to the pole resists all his efforts to drag it to the shore; the chain by which it is fastened defies his teeth; he struggles for a time, and at length sinks to the bottom and is drowned. Occasionally it happens that several members of a beaver family are trapped in succession. The survivors then become extremely shy, and can scarcely be 'brought to medicine,' to use the trapper's phrase for 'taking the bait.' In such case, the trapper gives up the use of the bait, and conceals his traps in the usual paths and crossing places of the household. The beaver now being completely 'up to trap,' approaches them cautiously, and springs them ingeniously with a stick. At other times, he turns the traps bottom upwards by the same means, and occasionally even drags them to the barrier and conceals them in the mud. The trapper now gives up the contest of ingenuity, and, shouldering his traps, marches off, admitting that he is not yet 'up to the beaver.'"—*Adventures of Captain Bonneville, by Washington Irving.*

It has been often remarked, that all animals are sagacious in proportion to the size of their brain. It has, in support of this opinion, been alleged, that man, with respect to his bulk, has, of all others, the largest. In pursuance of this assumption, some erroneous speculations have been formed. But, were the size of the brain to determine the quantity of the understanding, the seal would, of all other animals, be the most sagacious; for it has, in proportion, the largest brain of any, even man himself not excepted. However, this animal is possessed of but very few advantages over other quadrupeds; and the size of its brain furnishes it with few powers that contribute to its wisdom or its preservation.[16]

This animal differs also in the formation of its tongue from all other quadrupeds. It is forked or slit at the end, like that of serpents; but for what purpose it is thus singularly contrived we are at a loss to know. We are much better informed with respect to a third singularity in its conformation, which is, that the *foramen ovale* in the heart is open. Those who are in the least acquainted with anatomy, know, that the veins uniting bring their blood to the heart, which sends it into the lungs, and from thence it returns to the heart again to be distributed through the whole body. Animals, however, before they are born, make no use of their lungs; and therefore their blood, without entering their lungs, takes a shorter passage through the very partition of the heart, from one of its chambers to the other, thus passing from the veins directly into those vessels that drive it through the whole frame. But the moment the animal is brought forth, the passage through the partition, which passage is called the *foramen ovale*, closes up, and continues closed for ever; for the blood then takes its longest course through the lungs to return to the other chamber of the heart again. Now the seal's heart resembles that of an infant in the womb, for the *foramen ovale* never closes;[17] and although the blood of this animal commonly circulates through the lungs, yet it can circulate without their assistance, as was observed above, by a shorter way. From hence, therefore, we see the manner in which this animal is adapted for continuing under water; for, being under no immediate necessity of breathing, the vital motions are still carried on while it continues at the bottom: so that it can pursue its prey in that element, and yet enjoy all the delights and advantages of ours.

The water is the seal's usual habitation, and whatever fish it can catch its food. Though not equal in instinct and cunning to some terrestrial animals, it is greatly superior to the mute tenants of that element in which it chiefly resides. Although it can continue for several minutes under water, yet it is not able, like fishes, to remain there for any length of time; and a seal may be drowned, like any other terrestrial animal. Thus it seems superior, in some respects, to the inhabitants of both elements, and inferior in many more. Although furnished with legs, it is, in some measure, deprived of all the advantages of them.[18] They are shut up within its body, while nothing appears but the extremities of them, and these furnished with very little motion, but to serve them as fins in the water. The hind-feet, indeed, being turned backwards, are entirely useless upon land; so that when the animal is obliged to move, it drags itself forward like a reptile, and with an effort more painful. For this purpose it is obliged to use its fore-feet, which, though very short, serve to give it such a degree of swiftness that a man cannnot readily overtake it; and it runs toward the sea. As it is thus awkwardly formed for going upon land, it is seldom found at any distance from the sea-shore, but continues to bask upon the rocks; and when disturbed always plunges down at once to the bottom.

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[15] See Supplementary Note, p. 473.

[16] Although deficient in their organs of sense, and the general formation of their members, seals display unusual sagacity, which goes to prove the influence of the brain in all that is intellectual. Of three seals, in the French menagerie, upon which Cuvier made observations, none of them experienced fear in the presence of man, or any other animal. Nothing ever induced them to fly, except approaching so near as to excite in them the apprehension of being trodden under foot, and even in this case they only avoided the danger by removing to a little distance. One of them, indeed, would sometimes threaten with its voice, and strike with its paw; but it would never bite, except in the last extremity. In taking their food, they evinced a similar gentleness of character. Though very voracious, they could behold it withdrawn from them without fear or resistance. They would suffer the fish which had been just given them to be taken away with impunity, and some young dogs, to which one of those seals was attached, would amuse themselves in snatching the fish from his mouth which he was just ready to swallow, without his testifying the least anger. When two seals, however, were allowed to eat together, the usual result was a combat carried on with their paws, which ended by the weakest or most timid leaving the field in possession of his antagonist. With the exception of some species of the monkey, there is scarcely any wild animal more easily tamed than the seal, or capable of a stronger degree of attachment. One of the individuals before-mentioned showed, at first, some degree of shyness, and fled at the show of caresses; but, in a few days, his fear was totally at an end. He soon discovered the nature and intent of such movements, and his confidence became unbounded. This same phoca was shut up with two little dogs, who used to mount upon his back, bark at, and seemed to bite him; and although sports of this kind were at variance with his habits and nature, he soon learned to appreciate their motive, and to take pleasure in them. He never replied to them, but by gentle strokes of his paw, which seemed rather intended to excite than to repress them. If the dogs escaped he would follow them, though walking over ground covered with stones and mud must have been a painful effort to him; and when cold weather came, he and the dogs would lie closely together, to keep each other warm. Another was peculiarly attached to the person who had the care of him; he soon learned to know this person at any distance within his range of vision. He would hold his eyes fixed upon him while he was present, and run forward the moment he saw him approach. Hunger, to be sure, entered for something into the affection he testified towards his keepers. The continual attention which he paid to every motion connected with the gratification of his appetite had made him remark, at the distance of sixty paces, the place which contained his food, although it was devoted to several other uses, and though it was entered but twice a-day for the purpose of procuring his nutriment. If he was at liberty when his keeper approached to feed him, he would run forward, and solicit his food by lively motions of his head and the most expressive glances of his eye. This animal exhibited many other instances of considerable intelligence.—ED.

[17] I have followed the usual observations of naturalists with respect to the *foramen ovale* in this animal: I have many reasons, however, to incline me to think that the *foramen* is not entirely open. But this is not the place for a critical inquiry of this kind.

The seal is a social animal, and wherever it frequents, numbers are generally seen together. They are found in every climate, but in the north and icy seas they are particularly numerous. It is on those shores, which are less inhabited than ours, and where the fish resort in greater abundance, that they are seen by thousands, like flocks of sheep, basking on the rocks, and suckling their young. There they keep watch like other gregarious animals; and, if an enemy appear, instantly plunge all together into the water. In fine weather they more usually employ their time in fishing; and generally come on shore in tempests and storms. The seal seems the only animal that takes delight in these tremendous conflicts of nature. In the midst of thunders and torrents, when every other creature takes refuge from the fury of the elements, the seals are seen by thousands sporting along the shore, and delighted with the universal disorder! This, however, may arise from the sea being at that time too turbulent for them to reside in; and they may then particularly come upon land when unable to resist the shock of their more usual element.

As seals are gregarious, so are they also animals of passage, and perhaps the only quadrupeds that migrate from one part of the world to another. The generality of quadrupeds are contented with their native plains and forests, and seldom stray, except when necessity or fear impels them. But seals change their habitation, and are seen in vast multitudes directing their course from one continent to another.[19] On the northern coasts of Greenland they are seen to retire in July, and to return again in September. This time it is supposed they go in pursuit of food. But they make a second departure in March, to cast their young, and return in the beginning of June, young and all, in a great body together, observing in their route a certain fixed time and track, like birds of passage. When they go upon this expedition, they are seen in great droves, for many days together, making towards the north, taking that part of the sea most free from ice, and going still forward into those seas where man cannot follow. In what manner they return, or by what passage, is utterly unknown; it is only observed, that when they leave the coasts to go upon this expedition, they are all extremely fat, but on their return they come home excessively lean.

The females, in our climate, bring forth in winter, and rear their young upon some sand-bank, rock, or desolate island, at some distance from the continent. When they suckle their young they sit up on their hinder-legs, while these, which are at first white, with woolly hair, cling to the teats, of which there are four in number, near the navel.[20] In this manner the young continue in the place where they were brought forth, for twelve or fifteen days; after which the dam brings them down to the water, and accustoms them to swim and get their food by their own industry. As each litter never exceeds above three or four, so the animal's cares are not much divided, and the education of her little ones is soon completed. In fact, the young are particularly docile; they understand the mother's voice among the numerous bleatings of the rest of the old ones; they mutually assist each other in danger, and are perfectly obedient to her call. Thus early accustomed to subjection, they continue to live in society, hunt and herd together, and have a variety of tones by which they encourage to pursue, or warn each other of danger. Some compare their voices to the bleating of a flock of sheep, interrupted now and then by the barking of angry dogs, and sometimes the shriller notes of a cat.[21] All along the shore, each has its own peculiar rock, of which it takes possession, and where it sleeps when fatigued with fishing, uninterrupted by any of the rest. The only season when their social spirit seems to forsake them, is that when they feel the influences of natural desire. They then fight most desperately, and the male that is victorious keeps all the females to himself. Their combats, on these occasions, are managed with great obstinacy, and yet great justice: two are never seen to fall upon one together; but each has its antagonist, and all fight an equal battle, till one alone becomes victorious.

We are not certainly informed how long the females continue pregnant; but if we may judge from the time which intervenes between their departure from the Greenland coasts and their return, they cannot go above seven or eight months at the farthest. How long this animal lives is also unknown: a gentleman, whom I knew in Ireland, kept two of them, which he had taken very young, in his house for ten years; and they appeared to have the marks of age at the time I saw them, for they were grown gray about the muzzle; and it is very probable they did not live many years longer. In their natural state the old ones are seen very fat and torpid, separated from the rest, and, as it should seem, incapable of procreation.

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[18] Buffon.

[19] Krantz, vol. i. p. 129.

[20] Coeunt in littore resupinata femina.—Lin. Syst

[21] Linnæi Syst.

As their chief food is fish, so they are very expert at pursuing and catching it. In those places where the herrings are seen in shoals, the seals frequent and destroy them by thousands. When the herring retires, the seal is then obliged to hunt after fish that are stronger and more capable of evading the pursuit: however, they are very swift in deep waters, dive with great rapidity, and, while the spectator eyes the spot at which they disappear, they are seen to emerge at above a hundred yards' distance. The weaker fishes, therefore, have no other means to escape their tyranny, but by darting into the shallows. The seal has been seen to pursue a mullet, which is a swift swimmer, and to turn it to and fro in deep water, as a hound does a hare on land. The mullet has been seen trying every art of evasion; and at last swimming into shallow water, in hopes of escaping. There, however, the seal followed; so that the little animal had no other way left to escape, but to throw itself on one side, by which means it darted into shoaler water than it could have swam in with the belly undermost; and thus at last it got free.

As they are thus the tyrants of the element in which they chiefly reside, so they are not very fearful even upon land, except on those shores which are thickly inhabited, and from whence they have been frequently pursued. Along the desert coasts, where they are seldom interrupted by man, they seem to be very bold and courageous; if attacked with stones, like dogs, they bite such as are thrown against them; if encountered more closely, they make a desperate resistance, and, while they have any life, attempt to annoy their enemy. Some have been known, even while they were skinning, to turn round and seize their butchers; but they are generally despatched by a stunning blow on the nose. They usually sleep soundly where not frequently disturbed; and that is the time when the hunters surprise them. The Europeans who go into the Greenland seas upon the whale fishery, surround them with nets, and knock them on the head; but the Greenlanders, who are unprovided with so expensive an apparatus, destroy them in a different manner. One of these little men paddles away in his boat, and when he sees a seal asleep on the side of a rock, darts his lance, and that with such unerring aim, that it never fails to bury its point in the animal's side. The seal, feeling itself wounded, instantly plunges from the top of the rock, lance and all, into the sea, and dives to the bottom; but the lance has a bladder tied to one end, which keeps buoyant, and resists the animal's descent; so that every time the seal rises to the top of the water the Greenlander strikes it with his oar, until he at last despatches it. But, in our climate, the seals are much more wary, and seldom suffer the hunter to come near them. They are often seen upon the rocks of the Cornish coast, basking in the sun, or upon the inaccessible cliffs left dry by the tide. There they continue, extremely watchful, and never sleep long without moving; seldom longer than a minute; for then they raise their heads, and if they see no danger, they lie down again, raising and reclining their heads alternately, at intervals of about a minute each. The only method, therefore, that can be taken, is to shoot them: if they chance to escape, they hasten towards the deep, fling stones and dirt behind them as they scramble along,[23] and at the same time expressing their pain, or their fears, by the most distressful cry; if they happen to be overtaken, they make a vigorous resistance with their feet and teeth, till they are killed.

The seal is taken for the sake of its skin, and for the oil its fat yields. The former sells for about four shillings; and, when dressed, is very useful in covering trunks, making waistcoats, shot-pouches, and several other conveniences. The flesh of this animal formerly found place at the tables of the great. At a feast provided by Archbishop Neville, for Edward the Fourth, there were twelve seals and porpoises provided, among other extraordinary rarities.

As a variety of this animal we may mention the SEA-LION, described in Anson's Voyages. This is much larger than any of the former; being from eleven to eighteen feet long. It is so fat, that when the skin is taken off, the blubber lies a foot thick all round the body. It seems to differ from the ordinary seal, not only in its size, but also in its food; for it is often seen to graze along the shore, and to feed upon the long grass that grows up along the edges of brooks. Its cry is very various, sometimes resembling the neighing of a horse, and sometimes the grunting of a hog. It may be regarded as the largest of the seal family

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[22] British Zoology, vol. i. p. 75.

[23] Mr. Laing, in his 'Account of a Voyage to Spitzbergen,' [London, 8vo., 1815,] affirms that he has sometimes seen seals "throw back stones and pieces of ice on the sailors who pursued them." One might suppose, from language such as this, that these animals occasionally engaged in a species of missile warfare with their pursuers; but it is certain that this "flinging of stones and dirt behind them," as it is expressed in our text, could only be occasioned by the violent efforts of the hind-feet of these animals as they scuttled over a pebbly beach —ED.

THE MORSE.

The morse is an animal of the seal kind; but differing from the rest, in a very particular formation of the teeth, having two large tusks growing from the upper jaw, shaped like those of an elephant, but directed downwards; whereas in the elephant they grow upright, like horns; it also wants the cutting teeth, both above and below: as to the rest, it pretty much resembles a seal, except that it is much larger, being from twelve to sixteen feet long. The morses are also generally seen to frequent the same places that seals are known to reside in; they have the same habitudes, the same advantages, and the same imperfections. There are, however, fewer varieties of the morse than the seal; and they are rarely found, except in the frozen regions near the pole. They were formerly more numerous than at present; and the savage natives of the coasts of Greenland destroyed them in much greater quantities, before those seas were visited by European ships upon the whale-fishery, than now. Whether these animals have been since actually thinned by the fishers, or have removed to some more distant and unfrequented shores, is not known; but certain it is, that the Greenlanders, who once had plenty, are now obliged to toil more assiduously for subsistence; and as the quantity of their provisions decrease, for they live mostly upon seals, the numbers of that poor people are every day diminishing. As to the teeth, they are generally from two to three feet long; and the ivory is much more esteemed than that of the elephant, being whiter and harder. The fishers have been known formerly to kill three or four hundred at once; and along those shores where they chiefly frequented, their bones are still seen lying in prodigious quantities. In this manner a supply of provisions, which would have supported the Greenland nation for ages, has been, in a few years, sacrificed to those who did not use them, but who sought them for the purposes of avarice and luxury!

THE MANATI.

We come, in the last place, to an animal that terminates the boundary between quadrupeds and fishes. Instead of a creature preying among the deeps, and retiring upon land for repose or refreshment, we have here an animal that never leaves the water, and is enabled to live only there. It cannot be called a quadruped, as it has but two legs only: nor can it be called a fish, as it is covered with hair. In short, it forms the link that unites those two great tribes to each other; and may be indiscriminately called the last of beasts, or the first of fishes.

We have seen the seal approaching nearly to the aquatic tribes, by having its hind-legs thrown back on each side of the tail, and forming something that resembled the tail of a fish; but upon examining the skeleton of that animal, its title to the rank of a quadruped was observed plainly to appear, having all the bones of the hinder legs and feet as complete as any other animal whatsoever.

But we are now come to a creature that not only wants the external appearance of hinder legs, but, when examined internally, will be found to want them altogether. The manati is somewhat shaped in the head and the body like a seal; it has also the fore-legs or hands pretty much in the same manner, short and webbed, but with four claws only; these also are shorter in proportion than in the former animal, and placed nearer the head; so that they can scarcely assist its motions upon land. But it is in the hinder parts that it chiefly differs from all others of the seal kind; for the tail is perfectly that of a fish, being spread out broad like a fan, and wanting even the vestiges of those bones which make the legs and feet in others of its kind. The largest of these are about twenty-six feet in length; the skin is blackish, very tough and hard; when cut, as black as ebony; and there are a few hairs scattered, like bristles, of about an inch long. The eyes are very small, in proportion to the animal's head; and the ear-holes, for it has no external ears, are so narrow as scarcely to admit a pin's head. The tongue is so short, that some have pretended it has none at all; and the teeth are composed only of two solid white bones, running the whole length of both jaws, and formed merely for chewing, and not tearing its vegetable food. The female has breasts placed forward, like those of a woman; and she brings forth but one at a time: this she holds with her paws to her bosom; there it sticks, and accompanies her wherever she goes.

This animal can scarcely be called amphibious, as it never entirely leaves the water, only advancing the head out of the stream to reach the grass on the river sides. Its food is entirely upon vegetables; and, therefore, it is never found far in the open sea, but chiefly in the large rivers of South America; and often above two thousand miles from the ocean. It is also found in the seas near Kamtschatka, and feeds upon the weeds that grow near the shore. There are likewise level greens at the bottom of some of the Indian bays, and there the manaties are harmlessly seen grazing among turtles and other crustaceous fishes, neither giving nor fearing any disturbance. These animals, when unmolested, keep together in large companies, and surround their young ones.[24] They bring forth most commonly in autumn; and it is supposed they go with young eighteen months, for the time of generation is in spring.

The manati has no voice nor cry, for the only noise it makes is by fetching its breath. Its internal parts somewhat resemble those of a horse; its intestines being longer, in proportion, than those of any other creature, the horse only excepted.

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[24] Acta Pretopolitana.

The fat of the manati, which lies under the skin, when exposed to the sun, has a fine smell and taste, and far exceeds the fat of any sea animal; it has this peculiar property, that the heat of the sun will not spoil it, nor make it grow rancid: its taste is like the oil of sweet almonds; and it will serve very well, in all cases, instead of butter: any quantity may be taken inwardly with safety, for it has no other effect than keeping the body open. The fat of the tail is of a harder consistence: and, when boiled, is more delicate than the former. The lean is like beef, but more red; and may be kept a long while, in the hottest days, without tainting. It takes up a long time in boiling; and, when done, eats like beef. The fat of the young ones is like pork; the lean is like veal; and, upon the whole, it is very probable that this animal's flesh somewhat resembles that of turtle; since they are fed in the same element, and upon the very same food. The turtle is a delicacy well known among us: our luxuries are not as yet sufficiently heightened to introduce the manati; which if it could be brought over, might singly suffice for a whole corporation![25]

Note.—*Of the Seal Species.*

The Ursine Seal. The males are about eight feet in length, but the females are much smaller. Their bodies are thick, decreasing somewhat towards the tail. The nose projects like that of a pug-dog; and the eyes are large and prominent. The fore-legs are about two feet in length, and, with the feet, have somewhat the appearance of turtle's fins The hind-legs are rather shorter, and have five toes separated by a web. The general colour of the hair is black, and that of the old ones is tipped with gray. The females are ash-coloured.

The Ursine Seals live in families, every male being surrounded by from eight to fifty females, whom he guards with the utmost jealousy; each family keeps separate from the others, although they lie by thousands on the shores which they inhabit. The males exhibit great affection towards their young, and equal tyranny towards the females.—They are fierce in the protection of the former; and, should any one attempt to carry off their cub, they will stand on the defensive, while the female conveys it in her mouth. Should she happen to drop it, the male instantly quits his enemy, falls on her, and beats her against the stones till he leaves her for dead. But if the young one is entirely carried off, he melts into the greatest affliction, shedding tears, and exhibiting every mark of sorrow.

Those animals that, through age or impotence, are deserted by the females, withdraw themselves from society, and not only become excessively splenetic, peevish, and quarrelsome, but so much attached to their own stations, as to prefer death to the loss of them. If they perceive another animal approaching them, they are instantly roused from their indolence, snap at the encroacher, and give him battle. During the fight, they sometimes intrude on the station of their neighbour, who then joins in the contest; so that at length the civil discord spreads through the whole shore, attended with hideous growls, their note of war. This is one of the causes of the disputes which take place among these irritable creatures. But a much more serious cause is, when an attempt is made to seduce away any of their females. A battle is the sure consequence of the insult; and sad indeed is the fate of the vanquished animal; he instantly loses his whole seraglio, who all desert him and attach themselves to the victor. When only two of the animals are engaged in combat, they rest at intervals, lying down near each other; then, rising both at once, renew the battle. They fight with their heads erect, and turn them aside to avoid the blows. As long as their strength continues equal, they only use their fore-paws; but if one of them fails, the other seizes him with his teeth, and throws him on the ground. The wounds they inflict are very deep, and like the cut of a sabre; and, it is said, that in the month of July, scarcely one is to be seen that has not some mark of this description. At the conclusion of an engagement, such as are able throw themselves into the sea, in order to wash off the blood. They are exceedingly tenacious of life, and will sometimes live a fortnight after receiving such wounds as would immediately have destroyed any other animal.

The Hooded Seal. The head is without ears; there are four fore-teeth in each jaw: the fore-feet are undivided; the hind-feet are without nails. It inhabits the coast of Dalmatia. The skin of the neck folds into the resemblance of a monk's hood; the hair is short, dusky, and spotted with ash; above the navel is a tawny spot. It is from seven to eight feet in length.

The Bottle-Nosed Seal. The male of this species is extremely large, sometimes measuring from fifteen to twenty feet in length; he is also distinguished from the female by a large snout, projecting five or six inches below the end of the upper jaw. The feet are short, and the hinder ones so webbed as to appear like fins. The general colour of the hair is ferruginous. Their fat is so considerable, as to lie ten or twelve inches deep between the skin and the flesh. Hence, when they are in motion, they appear almost like immense skins filled with oil, the tremulous motion of the blubber being plainly discernible beneath the surface. They have also so much blood, that if deeply wounded in a dozen places, it will gush out at every one, and spout to a considerable distance. Their usual voice is a kind of grunting, or sometimes a snorting like that of a horse in full vigour. They are of a lethargic disposition, and when at rest they are not easily disturbed. Their time seems pretty equally divided between the land and the sea, as they continue out during the summer, and come on shore at the commencement of winter. —They feed on the grass and verdure which grows on the banks of the fresh-water streams: and when not employed in feeding, they sleep in herds in the most miry places they can find. Each herd seems to be under the direction of a large male, which mariners ludicrously style the bashaw, from his driving off the other males from a number of females which he appropriates to himself.—These bashaws, however, do not arrive at this envied superiority without many fierce and sanguinary conflicts, of which their numerous scars generally bear evidence. Some of Lord Anson's people observed one day on the island of Juan Fernandez, what they at first supposed to be animals of a kind different from any they had previously seen; but, on a nearer approach, they proved to be two of these seals, which had been goring each other with their teeth, till both were completely covered with blood. It is not difficult to kill them; for their propensity to sleep, and their sluggish and unwieldy motions, generally render them an easy prey to their enemies. Sometimes, however, they make a vigorous resistance; and, it is said, that as a sailor was one day employed in skinning one of the young, the female from whom he had taken it, came upon him unperceived, and getting his head into her mouth, lacerated his skull so dreadfully, that he died in a few days afterwards. According to Lord Anson's account, the flesh of these quadrupeds is somewhat like beef, and the hearts and tongues are excellent eating.

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[25] To those amphibious quadrupeds may be added the duck-billed platypus, or ornithorynchus, described by Dr. Shaw in his 'Naturalist's Miscellany.' The body is depressed, and has some resemblance to that of an otter in miniature; and is covered with a soft beaver-like fur; but its most striking peculiarity is the strange situation of its mouth or snout, exhibiting the perfect resemblance of the beak of a duck engrafted on the head of a quadruped; and so accurate is the similitude, that at first view it naturally excites the idea of some deceptive preparation by artificial means. These animals have hitherto been found only in the rivers of New Holland. They are expert swimmers, and seldom quit the water. On shore, they crawl rather than walk, occasioned by the shortness of the limbs, and comparative length of the body. They probably live on worms and aquatic insects.—Ed.

These animals are principally found on the coast of Zealand, on the island of Juan Fernandez, and the Falkland Islands. The females produce two young ones in the winter, which they suckle for some time. These, when first brought forth, are about the size of a full-grown common seal.

BOOK VIII.*

OF THE MONKEY KIND.

Quadrupeds may be considered as a numerous group, terminated on every side by some that but in part deserve the name. On one quarter we see a tribe covered with quills, or furnished with wings, that lift them among the inhabitants of the air; on another, we behold a diversity clothed with scales and shells, to rank with insects; and still on a third, we see them descending into the waters, to live among the mute tenants of that element. We now come to a numerous tribe, that leaving the brute creation, seem to make approaches even to humanity; that bear an awkward resemblance of the human form, and discover some faint efforts at intellectual sagacity.

Animals of the Monkey class are furnished with hands instead of paws; their ears, eyes, eyelids, lips, and breasts, are like those of mankind; their internal conformation also bears some distant likeness; and the whole offers a picture that may well mortify the pride of such as make their persons alone the principal object of their admiration. These approaches, however, are gradual; and some bear the marks of this our boasted form more strongly than others.

In the Ape kind we see the whole external machine strongly impressed with the human likeness, and capable of the same exertions: these walk upright, want a tail, have fleshy posteriors, have calves to their legs; and feet nearly like ours.

In the Baboon kind we perceive a more distant approach to the human form; the quadruped mixing in every part of the animal's figure: these generally go upon all fours; but some, when upright, are as tall as a man; they have short tails, long snouts, and are possessed of brutal fierceness.

The Monkey kind are removed a step further; these are much less than the former, with tails as long, or longer, than their bodies, and flattish faces.

Lastly, the Maki and Opossum kind, seem to lose all resemblance of the human figure, except in having hands; their noses are lengthened out like those of quadrupeds, and every part of their bodies totally different from the human; however, as they grasp their food, or other objects, with one hand, which quadrupeds cannot do, this single similitude gives them an air of sagacity, to which they have scarcely any other pretensions.

From this slight survey it may be easily seen that one general description will not serve for animals so very different from each other: nevertheless, it will be fatiguing to the last degree, as their varieties are so numerous, and their differences so small, to go through a particular description of each. In this case it will be best to give a history of the foremost in each class; at the same time marking the distinctions in every species. By this we shall avoid a tedious repetition of similar characters, and consider the manners and the oddities of this fantastic tribe in general points of view; where we shall perceive how nearly they approach to the human figure.

* In arranging the present edition of Goldsmith's 'Natural History,' we have made a distinct book under this head, without throwing into this book—as has been done in all other editions of the work—descriptions of all the other quadrupeds not specially belonging to the preceding sections in Goldsmith's inartificial but pleasing arrangement. After describing the animals "of the Monkey kind," our author passes, at one bound, to the description of the elephant. The description of these unclassified animals, completing that of quadrupeds in general, seems obviously to form a natural and leading division in the arrangement of the work; and has accordingly been given in a distinct book [IX], at p. 497.—Ed.

and how little they benefit by the approximation.[1] The foremost of the ape kind is

THE ORAN-OUTANG, OR WILD MAN OF THE WOODS.

This name seems to have been given to various animals, agreeing in one common character of walking upright, but coming from different countries, and of very different proportions and powers. The TROGLODYTE of Bontius, the DRILL of Purchas, and the PIGMY of Tyson, have all received this general name: and have been ranked by some naturalists under one general description.[2] If we read the accounts of many remote travellers, under this name we are presented with a formidable animal, from six to eight feet high; if we examine the books of such as have described it nearer home, we find it a pigmy not above three. In this diversity we must be content to blend their various descriptions into one general account; observing, at the same time, that we have no reason to doubt any of their relations, although we are puzzled which to follow.

The oran-outang, which of all other animals most nearly approaches to the human race, is seen of different sizes, from three to seven feet high. In general, however, its stature is less than that of a man; but its strength and agility much greater. Travellers, who have seen various kinds of these animals in their native solitudes, give us surprising relations of their force, their swiftness, their address, and their ferocity. Naturalists, who have observed their form and manners at home, have been as much struck with their patient, pliant, imitative dispositions; with their appearance and conformation, so nearly human. Of the smallest sort of these animals we have had several, at different times, brought into this country, all nearly alike: but that observed by Dr. Tyson is the best known, having been described with the greatest exactness.[3]

The animal which was described by that learned physician was brought from Angola, in Africa, where it had been taken in the internal parts of the country, in company with a female of the same kind, that died by the way. The body was covered with hair, which was of a coal black colour, more resembling human hair than that of brutes. It bore a still stronger similitude in its different lengths; for in those places where it is longest on the human species it was also longest in this; as on the head, the upper lip, the chin, and the pubes. The face was like that of a man, the forehead larger, and the head round. The upper and lower jaw were not so prominent as in monkeys; but flat, like those of a man. The ears were like those of a man, in most respects; and the teeth had more resemblance to the human than those of any other creature. The bending of the arms and legs was just the same as in a man; and, in short, the animal at first view presented a figure entirely human.

In order to discover its differences, it was necessary to take a closer survey; and then the imperfections of its form began to appear. The first obvious difference was in the flatness of the nose; the next in the lowness of the forehead, and the wanting the prominence of the chin. The ears were proportionably too large; the eyes too close to each other; and the interval between the nose and mouth too great. The body and limbs differed, in the thighs being too short, and the arms too long; in the thumb being too little, and the palm of the hand too narrow. The feet also were rather more like hands than feet; and the animal, if we may judge from the figure, bent too much upon its haunches.

When this creature was examined anatomically, a surprising similitude was seen to prevail in its internal conformation. It differed from man in the number of its ribs, having thirteen, whereas, in man, there are but twelve. The vertebræ of the neck also were shorter, the bones of the pelvis narrower, the orbits of the eyes were deeper, the kidneys were rounder, the urinary and gall bladders were longer and smaller, and the ureters of a different figure. Such were the principal distinctions between the internal parts of this animal and those of man; in almost every thing else they were entirely and exactly the same, and discovered an astonishing congruity. Indeed, many parts were so much alike in conformation, that it might have excited wonder how they were productive of such few advantages. The tongue, and all the organs of the voice, were the same, and yet the animal was dumb; the brain was formed in the same manner with that of man, and yet the creature wanted reason; an evident proof, as Mr. Buffon finely observes, that no disposition of matter will give mind; and that the body, how nicely soever formed, is formed in vain, when there is not infused a soul to direct its operations.

Having thus taken a comparative view of this creature with man, what follows may be necessary to complete the general description. This animal was very hairy all behind, from the head downwards; and the hair so thick that it covered the skin almost from being seen: but in all parts before, the hair was much thinner, the skin everywhere appeared, and in some places it was almost bare. When it went on all-fours, as it was sometimes seen to do, it appeared all hairy; when it went erect, it appeared before less hairy, and more like a man. Its hair, which in this particular animal was black, much more resembled that of men than the fur of brutes; for, in the latter, besides their long hair, there is usually a finer and a shorter intermixed; but in the oran-outang it was all of a kind; only about the pubes the hair was grayish, seemed longer, and somewhat different; as also on the upper lip and chin, where it was grayish like the hair of a beard. The face, hands, and soles of the feet, were without hair; and so was the most part of the forehead: but down the sides of the face the hair was thick, it being there about an inch and a half long, which exceeded that on any other part of the body. In the palms of its hands were remarkable those lines which are usually taken notice of in palmistry; and, at the tips of the fingers, those spiral lines observed in man. The palms of the hands were as long as the soles of the feet; and the toes upon these were as long as the fingers; the middle toe was the longest of all, and the whole foot differed from the human. The hinder feet being thus formed as hands, the animal often used them as such; and, on the contrary, now and then made use of its hands instead of feet. The breasts appeared small and shrivelled, but exactly like those of a man: the navel also appeared very fair, and in exact disposition, being neither harder nor more prominent than what is usually seen in children. Such is the description of this extraordinary creature; to which little has been added by succeeding observers, except that the colour of the hair is often found to vary; in that described by Edwards it was of a reddish brown.

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[1] See Supplementary Note A, p. 489.

[2] The troglodyte, or chimpanse, is a distinct animal from the oran-outang. The chimpanse seldom measures more than from two feet and a half to three feet in height; and its hair is dark brown, or blackish. Its head is conic, the body brawny, the back and shoulders are hairy, and the rest of the body smooth. Two chimpanses were sent from the forests of the Carnatic by a coasting vessel, as a present to the governor of Bombay. They, like the rest of the species, had many human actions, and seemed, by their melancholy, to have a rational sense of their captivity. They were scarcely two feet high, but walked erect, and very nearly resembled the human form. The female was taken ill during the voyage, and died; and the male, exhibiting every demonstration of grief, refused to eat, and lived only two days afterwards. Both in face and form, the chimpanse has a closer approximation to humanity than the oran-outang. Its habitat is confined to intertropical Africa—that of the oran-outang is Asiatic.—Ed.

[3] See Supplementary Note B, p. 490.

From a picture so like that of the human species, we are naturally led to expect a corresponding mind; and it is certain, that such of these animals as have been shown in Europe, have discovered a degree of imitation beyond what any quadruped can arrive at.

That of Tyson was a gentle, fond, harmless creature. In its passage to England, those that it knew on ship-board it would embrace with the greatest tenderness, opening their bosoms, and clasping its hands about them. Monkeys of a lower species it held in utter aversion; it would always avoid the place where they were kept in the same vessel; and seemed to consider itself as a creature of higher extraction. After it was taken, and a little used to wear clothes, it grew very fond of them; a part it would put on without any help, and the rest it would carry in its hands to some of the company, for their assistance. It would lie in a bed, place its head on the pillow, and pull the clothes upwards as a man would do.

That which was seen by Edwards, and described by Buffon, showed even a superior degree of sagacity. It walked, like all of its kind, upon two legs, even though it carried burdens. Its air was melancholy, and its deportment grave. Unlike the baboon or monkey, whose motions are violent, and appetites capricious, who are fond of mischief, and obedient only from fear, this animal was slow in its motions, and a look was sufficient to keep it in awe. I have seen it, says Mr. Buffon, give its hand to show the company to the door: I have seen it sit at table, unfold its napkin, wipe its lips, make use of the spoon and the fork to carry the victuals to its mouth, pour out its drink into a glass, touch glasses when invited, take a cup and saucer and lay them on the table, put in sugar, pour out its tea, leave it to cool before drinking, and all this without any other instigation than the signs or command of its master, and often of its own accord. It was gentle and inoffensive; it even approached strangers with respect, and came rather to receive caresses than to offer injuries. It was particularly fond of sugared comfits, which every body was ready to give it; and as it had a defluxion upon the breast, so much sugar contributed to increase the disorder, and shorten its life. It continued at Paris but one summer, and died in London. It ate indiscriminately of all things, but it preferred dry and ripe fruits to all other aliments. It would drink wine, but in small quantities, and gladly left it for milk, tea, or any other sweet liquor.

Such these animals appeared when brought into Europe. However, many of their extraordinary habits were probably the result of education, and we are not told how long the instructions they received for this purpose were continued. But we learn from another account that they take but a very short time to come to a great degree of imitative perfection. Mr. L. Brosse bought two young ones, that were but a year old, from a negro; and these at that early age discovered an astonishing power of imitation.[4] They even then sat at the table like men, ate of every thing without distinction, made use of their knife, spoon, and fork, both to eat their meat and help themselves. They drank wine and other liquors. When carried on ship-board they had signs for the cabin-boys expressive of their wants; and whenever these neglected attending upon them as they desired, they instantly flew into a passion, seized them by the arm, bit them, and kept them down. The male was sea-sick, and required attendance like a human creature; he was even twice bled in the arm, and every time afterwards, when he found himself out of order, he showed his arm, as desirous of being relieved by bleeding.

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[4] As quoted by Buffon, vol. xxviii. p. 77.

Pyrard relates, that in the province of Sierra Leone, in Africa, there are a kind of apes, called Baris, which are strong and muscular, and which, if properly instructed when young, serve as very useful domestics. They usually walk upright; they pound at a mortar; they go to the river to fetch water, this they carry back in a little pitcher on their heads; but if care be not taken to receive the pitcher at their return, they let it fall to the ground, and then seeing it broken, they begin to lament and cry for their loss. Le Compte's account is much to the same purpose, of an ape which he saw in the Straits of Molucca. "It walked upon its two hind-feet, which it bent a little, like a dog that had been taught to dance. It made use of its hands and arms as we do. Its visage was not much more disagreeable than that of a Hottentot; but the body was all over covered with a woolly hair of different colours. As to the rest it cried like a child; all its outward actions were so like the human, and the passions so lively and significant, that dumb men could scarcely better express their conceptions and desires. It had also that expression of passion or joy which we often see in children, stamping with its feet, and striking them against the ground, to show its spite, or when refused any thing it passionately longed for. Although these animals," continues he, "are very big, for that I saw was four feet high, their nimbleness is incredible. It is a pleasure beyond expression to see them run up the tackling of a ship, where they sometimes play as if they had a knack of vaulting peculiar to themselves, or as if they had been paid, like our rope-dancers, to divert the company. Sometimes, suspended by one arm, they poise themselves, and then turn all of a sudden round about a rope, with as much quickness as a wheel, or a sling put into motion. Sometimes holding the rope successively with their long fingers, and, letting their whole body fall into the air, they run full speed from one end to the other, and come back again with the same swiftness. There is no posture but they imitate, nor motion but they perform, bending themselves like a bow, rolling like a bowl, hanging by the hands, feet, and teeth, according to the different fancies with which their capricious imagination supplies them. But what is still more amazing than all, is their agility to fling themselves from one rope to another, though at thirty, forty, and fifty feet distance."

Such are the habitudes and the powers of the smaller class of these extraordinary creatures; but we are presented with a very different picture in those of a larger stature and more muscular form. The little animals we have been describing, which are seldom found above four feet high, seem to partake of the nature of dwarfs among the human species, being gentle, assiduous, and playful, rather fitted to amuse than terrify. But the gigantic races of the oran-outang, seen and described by travellers, are truly formidable, and in the gloomy forests, where they are only found, seem to hold undisputed dominion. Many of these are as tall or taller than a man; active, strong, and intrepid; cunning, lascivious, and cruel. This redoubtable rival of mankind is found in many parts of Africa, in the East Indies, in Madagascar, and in Borneo.[5] In the last of these places the people of quality course him as we do the stag; and this sort of hunting is one of the favourite amusements of the king himself. This creature is extremely swift of foot, endowed with extraordinary strength, and runs with prodigious celerity. His skin is all hairy, his eyes sunk in his head, his countenance stern, his face tanned, and all his lineaments, though exactly human, harsh and blackened by the sun. In Africa this creature is even still more formidable. Battel calls him the pongo, and assures us that in al. his proportions he resembles a man, except that he is much larger, even to a gigantic state. His face resembles that of a man, the eyes deep sunk in the head, the hair on each side extremely long, the visage naked and without hair, as also the ears and the hands. The body is lightly covered, and scarcely differing from that of a man, except that there are no calves to the legs. Still, however, the animal is seen to walk upon his hinder legs, and in an erect posture. He sleeps under trees, and builds himself a hut, which serves to protect him against the sun and the rains of the tropical climates, of which he is a native. He lives only upon fruits, and is no way carnivorous. He cannot speak, although furnished with a greater instinct than any other animal of the brute creation. When the negroes make a fire in the woods, this animal comes near and warms himself by the blaze. However, he has not skill enough to keep the flame alive by feeding it with fuel. They go together in companies, and if they happen to meet one of the human species remote from succour, they show him no mercy. They even attack the elephant, which they beat with their clubs, and oblige to leave that part of the forest which they claim as their own. It is impossible to take any of these dreadful creatures alive, for they are so strong that ten men would not be a match for but one of them. None of this kind, therefore, are taken except when very young, and these but rarely, when the female happens to leave them behind; for in general they keep clung to the breast, and adhere both with legs and arms. From the same traveller we learn, that when one of these animals dies, the rest cover the body with a quantity of leaves and branches. They sometimes also show mercy to the human kind. A negro boy, that was taken by one of these, and carried into the woods, continued there a whole year, without receiving any injury.[6] From another traveller we learn, that these animals often attempt to surprise the female negroes as they go into the woods, and frequently keep them against their wills for the pleasure of their company, feeding them very plentifully all the time. He assures us, that he knew a woman of Loango that had lived among these animals for three years. They grow from six to seven feet high, and of unequalled strength. They build sheds, and make use of clubs for their defence. Their faces are broad, their noses flat, their ears without a tip, their skins are more bright than that of a mulatto, and they are covered on many parts of the body with long and tawny-coloured hair. Their belly is large, their heels flat, and yet rising behind. They sometimes walk upright, and sometimes upon all-fours, when they are fantastically disposed.

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[5] Le Compte's History of China.

[6] Le Brosse, as quoted by Buffon, vol. xxviii. p. 70.

From this description of the oran-outang, we perceive at what a distance the first animal of the brute creation is placed from the very lowest of the human species. Even in countries peopled with savages, this creature is considered as a beast; and in those very places where we might suppose the smallest difference between them and mankind, the inhabitants hold it in the greatest contempt and detestation. In Borneo, where this animal has been said to come to its greatest perfection, the natives hunt it in the same manner as they pursue the elephant or the lion, while its resemblance to the human form procures it neither pity nor protection. The gradations of Nature in the other parts of nature are minute and insensible; in the passage from quadrupeds to fishes we can scarcely tell where the quadruped ends and the fish begins; in the descent from beasts to insects we can hardly distinguish the steps of the progression; but in the ascent from brutes to man, the line is strongly drawn, well marked, and unpassable. It is in vain that the oran-outang resembles man in form, or imitates many of his actions; he still continues a wretched helpless creature, pent up in the most gloomy part of the forest, and, with regard to the provision for his own happiness, inferior even to the elephant or the beaver in sagacity. To us, indeed, this animal seems much wiser than it really is. As we have long been used to measure the sagacity of all actions by their similitude to our own, and not their fitness to the animal's way of living, we are pleased with the imitations of the ape, even though we know they are far from contributing to the convenience of its situation. An ape, or a quadruped, when under the trammels of human education, may be an admirable object for human curiosity, but is very little advanced by all its learning in the road to its own felicity. On the contrary, I have never seen any of these long-instructed animals that did not, by their melancholy air, appear sensible of the wretchedness of their situation. Its marks of seeming sagacity were merely relative to us, and not to the animal; and all its boasted wisdom was merely of our own making.

There is, in fact, another circumstance relative to this animal, which ought not to be concealed. I have many reasons to believe that the most perfect of the kind are prone, like the rest of the quadruped creation, and only owe their erect attitude to human education. Almost all the travellers who speak of them, mention their going sometimes upon all-fours, and sometimes erect. As their chief residence is among trees, they are without doubt usually seen erect while they are climbing; but it is more than probable that their efforts to escape upon the ground are by running upon the hands and feet together. Schouten, who mentions their education, tells us that they are taken in traps, and taught in the beginning to walk upon their hind-legs; which certainly implies that in a state of nature they run upon all-fours. Add to this, that, when we examine the palms of their hands and the soles of their feet, we find both equally callous and beaten: a certain proof that both have been equally used. In those hot countries, where the apes are known to reside, the soles of the negroes' feet, who go bare-foot, are covered with a skin above an inch thick; while their hands are as soft as those of a European. Did the apes walk in the same manner, the same exercise would have furnished them with similar advantages, which is not the case. Besides all this, I have been assured by a very credible traveller, that these animals naturally run in the woods upon all-fours; and when they are taken, their hands are tied behind them, to teach them to walk upright. This attitude they learn after some time; and, thus instructed, they are sent into Europe to astonish the speculative with their near approaches to humanity, while it is never considered how much is natural, and how much has been acquired in the savage schools of Benin and Angola.

The animal next to these, and to be placed in the same class, is the APE, properly so called, or the PITHEKOS of the ancients. This is much less than the former, being not above a foot and a half high, but walks erect, is without a tail, and is easily tamed.

Of this kind also is the GIBBON, so called by Buffon, or the LONG-ARMED APE, which is a very extraordinary and remarkable creature.[7] It is of different sizes, being from four feet to two feet high. It walks erect, is without a tail, has a face resembling that of a man, with a circle of bushy hair all round the visage; its eyes are large, and sunk in its head; its face tanned, and its ears exactly proportioned. But that in which it chiefly differs from all others of the monkey tribe, is the extraordinary length of its arms, which, when the animal stands erect, are long enough to reach the ground; so that it can walk upon all-fours, and yet keep its erect posture at the same time. This animal, next to the oran-

[7] See Supplementary Note C, p. 493.

outang and the ape, most nearly resembles mankind, not only in form, but in gentle manners and tractable disposition. It is a native of the East Indies, and particularly found along the coasts of Coromandel.

The last of the ape kind is the CYNOCEPHALUS, or the MAGOT of Buffon.[8] This animal wants a tail, like the former, although there is a small protuberance at that part, which yet is rather formed by the skin than the bone. It differs also in having a large callous red rump. The face is prominent, and approaches more to that of quadrupeds than of man. The body is covered with a brownish hair, and yellow on the belly. It is about three feet and a half, or four feet high, and is a native of most parts of Africa and the East. As it recedes from man in its form, so also it appears different in its dispositions, being sullen, vicious, and untractable.[9]

THE BABOON.

Descending from the more perfect of the monkey kinds, we come to the baboon and its varieties, a large, fierce, and formidable race, that, mixing the figure of the man and the quadruped in their conformation, seem to possess only the defects of both; the petulance of the one, and the ferocity of the other. These animals have a short tail; a prominent face, with canine teeth, larger than those of men; and callosities on the rump.[10] In man the physiognomy may deceive, and the figure of the body does not always lead to the qualities of the mind; but in animals we may always judge of their dispositions by their looks, and form a just conjecture of their internal habits from their external form. If we compare the nature of the ape and the baboon by this easy rule, we shall at once be led to pronounce that they greatly differ in their dispositions, and that the latter are infinitely more fierce, savage, and malicious, than the former. The oran-outang, that so nearly resembles man in its figure, approaches also nearest in the gentleness of its manners and the pliancy of its temper. The cynocephalus, that of all other apes is most unlike man in form, and approaches nearer the dog in face, resembles also the brute in nature, being wild, restless, and impelled by a fretful impetuosity. But the baboon, who is still more remote, and resembles man only in having hands, who from having a tail, a prominent face, and sharp claws, approaches more nearly to the savage tribe, is every way fierce, malicious, ignorant, and untractable.

The BABOON, properly so called, is from three to four feet high, very strong built, with a thick body and limbs, and canine teeth, much longer than those of men. It has large callosities behind, which are quite naked and red. Its tail is crooked and thick, and about seven or eight inches long. Its snout, for it can hardly be called a face, is long and thick, and on each side of its cheeks it has a pouch, into which, when satiated with eating, it puts the remainder of its provisions. It is covered with long thick hair, of a reddish brown colour, and pretty uniform over the whole body. It walks more commonly upon all-fours than upright, and its hands as well as its feet are armed with long sharp claws, instead of the broad round nails of the ape kind.[11]

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[8] The magot or Barbary ape, placed by Cuvier at the head of the baboons, is an animal not without intelligence. It is to his intelligence that the magot owes the numberless torments inflicted upon him by the mountebanks and showmen. Excepting the orans and the gibbons, he is the only monkey of the Old continent capable of receiving a certain degree of instruction. The others, stupid or ferocious, were incapable in a state of slavery of comprehending anything; but they have the consequent advantage of preserving their repose, while the magot is constantly exposed to lose both his comfort and freedom. Notwithstanding this, the male magot only submits to the dominion of man in extreme youth, and when his active faculties have not yet acquired their complete force and development. Arrived at adolescence he begins to be less tractable, and, in a short time, refuses submission of every kind. Good treatment and bad are equally without effect upon him. Alike incapable of confidence and of fear, he evinces nothing but a savage love of independence, which appears to be his only want. The painful state into which this feeling throws him, especially when he is strongly excited by severity, soon plunges him into a melancholy which is speedily followed by consumption and death. The magot is considered more properly to belong to the monkeys than the baboons, as the mere absence of a tail is insufficient to characterize the larger divisions of the monkey tribe. The same may be said of what is called the black ape, a monkey of extremely rare occurrence.—Ed.

[9] Omnes femellæ hujusce et precedentium, ut et fere sequentium specierum, menstruali patiuntur fluxu sicut in feminis.

[10] Buffon, vol. xxviii. p. 183.

[11] In the true baboons the facial angle of the adult varies from 30° to 35°, and the superciliary crests are for the most part considerably elevated, as is also the ridge on the back of the head formed by the attachment of the temporal muscles, which as well as the canine teeth are large and powerful. The cheeks are furnished with pouches capable of much distension; and the muzzle terminates in a flattened extremity like that of the dog, on which the openings of the nostrils are situated. The tail is generally as long as, and sometimes even longer than the body; but in several of the species it is extremely short. The callosities are frequently of large size and disgustingly conspicuous. This genus is generally considered as the lowest in organization, and consequently in capacity and intelligence, of the tribe to which it belongs. The colour of the common baboon is reddish brown; his face and hands are black, and his upper eye-lids white. The hair of his cheeks forms a considerable tuft on each side; and the under surface of his body is but sparingly covered. In bulk he is equal to a middle-sized dog; his proportions are thickset and inelegant; he is by no means dull or inactive. When young he is gay, playful, and docile; but as he grows older he becomes untractable, malicious, and ferocious. He is sometimes even dangerous, his muscular strength

An animal thus made for strength, and furnished with dangerous weapons, is found, in fact, to be one of the most formidable of the savage race in those countries where it is bred. It appears in its native woods, to be impelled by two opposite passions; a hatred for the males of the human species, and a desire for women. Were we assured of these strange oppositions in its disposition from one testimony alone, the account might appear doubtful: but as it comes from a variety of the most credible witnesses, we cannot refuse our assent. From them, therefore, we learn, that these animals will often assail women in a body, and force them into the woods, where they keep them against their will and kill them when refractory. From the Chevalier Forbin we learn, that in Siam whole troops of these will often sally forth from their forests, and attack a village when they know the men are engaged in their rice harvest. They are on such occasions actuated as well by desire as by hunger; and not only plunder the houses of whatever provisions they can find but endeavour to force the women. These, however, as the Chevalier humorously relates, not at all liking either the manners or the figure of the paltry gallants, boldly stand on their defence, and with clubs, or whatever other arms they can provide, instead of answering their caresses, oblige their ugly suitors to retreat; not, however, before they have damaged or plundered everything eatable they can lay their hands on.

At the Cape of Good Hope they are less formidable, but to the best of their power, equally mischievous. They are there under a sort of natural discipline, and go about whatever they undertake with surprising skill and regularity. When they set about robbing an orchard or a vineyard, for they are extremely fond of grapes, apples, and ripe fruit, they do not go singly to work, but in large companies, and with preconcerted deliberation. On these occasions, a part of them enter the enclosure, while one is set to watch. The rest stand without the fence, and form a line reaching all the way from their fellows within, to their rendezvous without, which is generally in some craggy mountain. Everything being thus disposed, the plunderers within the orchard throw the fruit to those that are without as fast as they can gather it; or if the wall or hedge be high, to those that sit on the top; and these hand the plunder to those next them on the other side. Thus the fruit is pitched from one to another all along the line, till it is safely deposited at their head-quarters. They catch it as readily as the most skilful tennis-player can a ball; and while the business is going forward, which they conduct with great expedition, a most profound silence is observed among them. Their sentinel during this whole time continues upon the watch, extremely anxious and attentive; but if he perceives any one coming, he instantly sets up a loud cry, and at this signal the whole company scamper off. Nor yet are they at any time willing to leave the place empty-handed; for if they be plundering a bed of melons, for instance, they go off with one in their mouths, one in their hands, and one under their arm. If the pursuit is hot, they drop first that from under their arm, then that from their hand; and, if it be continued, they at last let fall that which they had hitherto kept in their mouths.

The natives of the Cape often take the young of these animals, and, feeding them with sheep and goat's milk, accustom them to guard their houses; which duty they perform with great punctuality. Those, however, that have been brought into Europe, are headstrong, rude, and untractable. Dogs and cats, when they have done anything wrong, will run off; but these seem careless and insensible of the mischief they do; and I have seen one of them break a whole table of china, as it should seem by design, without appearing in the least conscious of having done amiss. It was not, however, in any respect so formidable as that described by Mr. Buffon, of which he gives the following description :—"It was not," says he, "extremely ugly, and yet it excited horror. It continually appeared in a state of savage ferocity, gnashing its teeth, flying at the spectators, and furiously restless. It was obliged to be confined in an iron cage, the bars of which it so forcibly attempted to break, that the spectators were struck with apprehension. It was a sturdy bold animal, whose short limbs and powerful exertions showed vast strength and agility. The long hair with which it was covered seemed to add to its apparent abilities; which, however, were in reality so great, that it could easily overcome a single man, unless armed. As to the rest, it for ever appeared excited by that passion which renders the mildest animals at intervals furious. Its lasciviousness was constant, and its satisfactions particular. Some others also of the monkey kind showed the same degree of impudence, and particularly in the presence of women; but, as they were less in size, their petulance was less obvious, and their insolence more easily corrected."

But however violent the desires of these animals may be, they are not found to breed in our climate. The female brings forth usually but one at a time, which she carries in her arms, and in a peculiar manner clinging to her breast. As to the rest, these animals are not at all carnivorous; they principally feed upon fruits, roots, and corn, and generally keep together in companies. The internal parts are more unlike those of man than of quadrupeds, particularly the liver,

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and agility, together with the great power of his teeth and jaws, rendering him a formidable opponent. On this account it is absolutely necessary to keep him strictly confined. He is a native of Africa, and more especially of the tropical parts of the western coast.—ED.

which is, like that of a dog, divided into six lobes. The lungs are more divided, the guts in general are shorter, and the kidneys rounder and flatter.

The largest of the baboon kind is the MANDRIL; an ugly disgusting animal, with a tail shorter than the former, though of a much larger stature, being from four to five feet high. The muzzle is still longer than that of the preceding, it is of a bluish colour, and strongly marked with wrinkles, which give it a frightful appearance. But what renders it truly loathsome is, that from the nose there is always seen issuing a snot, which the animal takes care at intervals to lick off with its tongue, and swallow. It is a native of the Gold Coast; it is said to walk more frequently erect than upon all-fours; and when displeased, to weep like a child. There was one of them shown in England some years ago. It seemed tame, but stupid, and had a method of opening its mouth and blowing at such as came too near.

The WANDEROW is a baboon rather less than the former, with the body less compact and muscular, and the hinder parts seemingly more feeble. The tail is from seven to eight inches long; the muzzle is prominent as in the rest of this kind; but what particularly distinguishes it is a large long white head of hair, together with a monstrous white beard, coarse, rough, and descending; the colour of the rest of the body being brown or black. As to the rest, in its savage state, it is equally fierce with the others; but, with a proper education, it seems more tractable than most of its kind, and is chiefly seen in the woods of Ceylon and Malabar.[12]

The MAIMON of Buffon, which Edwards calls the PIGTAIL, is the last of the baboons, and in size rather approaches the monkey, being no larger than a cat. Its chief distinction, besides its prominent muzzle, like a baboon, is in the tail, which is about five or six inches long, and curled up like that of a hog; from which circumstance, peculiar to this animal, our English naturalists gave it the name. It is a native of Sumatra, and does not well endure the rigours of our climate. Edwards, however, kept one of them a year in London; and another of them happening at the same time to be exposed in a show of beasts, he brought the two exiles together, to see if they would claim or acknowledge their kindred. The moment they came into each other's presence, they testified their mutual satisfaction, and seemed quite transported at the interview.[13]

THE MONKEY.

THE varieties in the larger tribes of the monkey kind are but few; in the ape we have seen but four, and in the baboon about as many. But when we come to the smaller class, the differences among them seem too tedious for enumeration. These, as was observed in the beginning, are all small in stature, and with long tails, by which they are distinguished from the preceding, that entirely want the tail, or are large, and have but a short one. The varieties in the form and colour of dogs or squirrels is nothing to what are found among monkeys of the smaller kind. Bosman mentions above fifty sorts on the Gold Coast alone, and Smith confirms the account. Condamine asserts that it would take up a volume to describe the differences of these to be found along the river Amazons; and we are sure that every one of these is very different from those on the African coast. Naturalists, however, have undertaken to make a catalogue of their numbers; and they either transmit their descriptions from one to another, or only enumerate those few that have found their way to Europe, and have fallen within the narrow circle of their own observation. But though it may be proper enough to describe such as fall under notice, it is certainly wrong to offer a scanty catalogue as complete, and to induce the reader to suppose he sees a picture of the whole group of these animals, when he is only presented with a small part of the number. Such, therefore, as are fond of the reputation of adding new descriptions to the stock of natural history, have here a wide, though surely a barren, field to enlarge in; and they will find it no difficult matter, by observing the various animals of this kind that are from time to time brought from their native coasts to this country, to indulge in description, and to ring the changes upon all the technical terms with which this most pleasing science is obscured and rendered disgusting. For my own part, I will spare the reader and myself the trouble of entering into an elaborate description of each; content with observing once more, that their numbers are very great, and their differences trifling. There is scarcely a country in the tropical climates that does not swarm with them, and scarcely a forest that is not inhabited by a race of monkeys distinct from all others. Every different wood along the coasts of Africa may be considered as a separate colony of monkeys, differing from those of the next district in colour, in size, and malicious mischief. It is indeed remarkable, that the monkeys of two cantons are never found to mix with each other, but rigorously to observe a separation: each forest produces only its own; and these guard their limits from the intrusion of all strangers of a different race from themselves. In this they somewhat resemble the human inhabitants of the savage nations among whom they are found, where the petty kingdoms are numerous, and their manners opposite. There, in the extent of a few miles, the traveller is presented with men speaking different languages, professing different religions, governed by different laws, and only resembling each other in their mutual animosity.

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[12] The wanderows belong to that group of the monkey tribes of the Old world which has received its name from the macaque, as being probably the most common of all the species that compose it. This group or genus is distinguished by a blunt and elongated muzzle, forming a facial angle of from 40° to 45°; by the prominence of the superciliary crests, which overhang the eyes and give a peculiar expression to the physiognomy; by the retrocession of the forehead above; and by the comparative shortness of the tail, which is rarely equal in length to the body, but is in some species nearly reduced to the dwarfishness of a pig-tail, and in one or two others is nothing more than a mere tubercle. In their manners there is considerable variety, dependent in a great degree upon their age, and the society to which they have been accustomed.—ED.

[13] The dog-faced baboon is betwixt four and five feet high; the head and face greatly resemble that of a dog; the hair is of a dusky colour, and peculiarly long and shaggy, as far as the waist, but short on the hinder parts. The face is naked, and the ears are pointed and concealed in the fur. The dog-faced baboons are natives of various parts of Africa and Asia. These animals usually associate in vast companies. When travellers pass near their haunts, they are impudent enough to run into the nearest trees, and shake the boughs with great vehemence, at the same time chattering very loudly. They are so powerful, as, without any difficulty to overcome a man; and they frequently commit such depredations in cultivated grounds, that the proprietors are compelled to have armed men continually on the watch to prevent them from plundering. Amongst the mountains in the neighbourhood of the Cape of Good Hope, there are immense troops of these baboons, or of a variety very nearly allied to them. When any one approaches their haunts, they set up a universal and horrible cry for a minute or two, and then conceal themselves in their fortresses, and keep a profound silence. They seldom descend to the plains, except for the purpose of plundering the gardens that lie near the foot of the mountains.—ED.

In general, monkeys of all kinds, being less than the baboon, are endued with less powers of doing mischief. Indeed, the ferocity of their nature seems to diminish with their size; and when taken wild in the woods, they are sooner tamed, and more easily taught to imitate man, than the former. More gentle than the baboon, and less grave and sullen than the ape, they soon begin to exert all their sportive mimicries, and are easily restrained by correction. But it must be confessed that they will do nothing they are desired without beating; for, if their fears be entirely removed, they are the most insolent and headstrong animals in nature.

In their native woods they are not less the pests of man than of other animals. The monkeys, says a traveller,[14] are in possession of every forest where they reside, and may be considered as the masters of the place. Neither the tiger, nor the lion itself, will venture to dispute the dominion, since these, from the tops of trees, continually carry on an offensive war, and by their agility escape all possibility of pursuit. Nor have the birds less to fear from their continual depredations; for, as these harmless inhabitants of the wood usually build upon trees, the monkeys are for ever on the watch to find out and rob their nests; and such is their petulant delight in mischief, that they will fling their eggs against the ground, when they want appetite or inclination to devour them.

There is but one animal in all the forest that ventures to oppose the monkey, and that is the serpent. The larger snakes are often seen winding up the trees where the monkeys reside; and, when they happen to surprise them sleeping, swallow them whole, before the little animals have time to make a defence. In this manner, the two most mischievous kinds in all nature keep the whole forest between them; both equally formidable to each other, and for ever employed in mutual hostilities. The monkeys in general inhabit the tops of trees, and the serpents cling to the branches nearer the bottom, and in this manner they are for ever seen near each other, like enemies in the same field of battle. Some travellers, indeed, have supposed that their vicinity rather argued their mutual friendship, and that they united in this manner to form an offensive league against all the rest of animated nature.[15] "I have seen these monkeys," says Labat, "playing their gambols upon those very branches on which the snakes were reposing, and jumping over them without receiving any injury, although the serpents of that country were naturally vindictive, and always ready to bite whatever disturbed them." These gambols, however, were probably nothing more than the insults of an enemy that was conscious of its own safety; and the monkeys might have provoked the snake in the same manner as we often see sparrows twitter at a cat. However this be, the forest is generally divided between them; and these woods, which nature seems to have embellished with her richest magnificence, rather inspire terror than delight, and chiefly serve as retreats for mischief and malignity.

The enmity of these animals to mankind is partly ridiculous, and partly formidable. They seem, says Le Compte and others, to have a peculiar instinct in discovering their foes, and are perfectly skilled when attacked, in mutually defending and assisting each other. When a traveller enters among these woods, they consider him as an invader upon their dominions, and all join to repel the intrusion. At first they survey him with a kind of insolent curiosity. They jump from branch to branch, pursue him as he goes along, and make a loud chattering, to call the rest of their companions together. They then begin their hostilities by grinning, threatening, and flinging down the withered branches at him, which they break from the trees; they even take their excrements in their hands, and throw them at his head. Thus they attend him wherever he goes; jumping from tree to tree with such amazing swiftness, that the eye can scarcely attend their motions. Although they take the most desperate leaps, yet they are seldom seen to come to the ground, for they easily fasten upon the branches that break their fall, and stick, either by their hands, feet, or tail, wherever they touch. If one of them happens to be wounded, the rest assemble round, and clap their fingers into the wound, as if they were desirous of sounding its depth. If the blood flows in any quantity, some of them keep it shut up, while others get leaves, which they chew, and thrust into the opening: however extraordinary this may appear, it is asserted to be often seen, and to be strictly true. In this manner, they wage a petulant, unequal war; and are often killed in numbers before they think proper to make a retreat. This they effect with the same precipitation with which they at first came together. In this retreat the young are seen clinging to the back of the female, with which she jumps away, seemingly unembarrassed by the burden.

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[14] Description Historique de Macacar, p. 51.

[15] Labat, Relat. de l'Afriq. Occident. p. 317.

The curiosity of the Europeans has, in some measure, induced the natives of the places where these animals reside to catch or take them alive by every art they are able. The usual way in such case is to shoot the female as she carries her young, and then both, of course, tumble to the ground. But even this is not easily performed; for if the animal be not killed outright it will not fall; but clinging to some branch, continues, even when dead, its former grasp, and remains on the tree where it was shot until it drops off by putrefaction: in this manner it is totally lost to the pursuer; for to attempt climbing the tree, to bring either it or the young one down, would probably be fatal from the number of serpents that are hid among the branches. For this reason the sportsman always takes care to aim at the head; which if he hits, the monkey falls directly to the ground, and the young one comes down at the same time, clinging to its dead parent.

The Europeans along the coasts of Guinea often go into the woods to shoot monkeys; and nothing pleases the negroes more than to see those animals drop, against which they have the greatest animosity. They consider them, and not without reason, as the most mischievous and tormenting creatures in the world; and are happy to see their numbers destroyed, upon a double account; as well because they dread their devastations, as because they love their flesh. The monkey, which is always skinned before it is eaten, when served up at a negro feast, looks so like a child, that an European is shocked at the very sight. The natives, however, who are not so nice, devour it as one of the highest delicacies; and assiduously attend our sportsmen to profit by the spoil. But what they are chiefly astonished at, is to see our travellers carefully taking the young ones alive, while they leave them the old ones, that are certainly the most fit to be eaten. They cannot comprehend what advantage can arise to us from educating or keeping a little animal that by experience they know to be equally fraught with tricks and mischief: some of them have even been led to suppose, that with a kind of perverse affection, we love only creatures of the most mischievous kinds: and having seen us often buy young and tame monkeys, they have taken equal care to bring rats to our factors, offering them for sale, and greatly disappointed at finding no purchaser for so hopeful a commodity.[16]

The negroes consider these animals as their greatest plague; and, indeed, they do incredible damage when they come in companies to lay waste a field of Indian corn, or rice, or a plantation of sugar-canes. They carry off as much as they are able; and they destroy ten times more than they bear away. Their manner of plundering is pretty much like that of the baboons, already mentioned, in a garden. One of them stands sentinel upon a tree, while the rest are plundering, carefully and cautiously turning on every side, but particularly to that on which there is the greatest danger: in the meantime, the rest of the spoilers pursue their work with great silence and assiduity; they are not contented with the first blade of corn, or the first cane that they happen to lay their hands on; they first pull up such as appear most alluring to the eye; they turn it round, examine, compare it with others, and if they find it to their mind, stick it under one of their shoulders. When in this manner they have got their load, they begin to think of retreating: but if it should happen that the owners of the field appear to interrupt their depredations, their faithful sentinel instantly gives notice by crying out *Houp, houp, houp!* which the rest perfectly understand, and all at once throwing down the corn they hold in their left hands, scamper off upon three legs, carrying the remainder in the right. If they are still hotly pursued, they then are content to throw down their whole burden, and to take refuge among their woods, on the tops of which they remain in perfect security.

Were we to give faith to what some travellers assure us of the government, policies, and subordination of these animals, we might perhaps be taxed with credulity; but we have no reason to doubt that they are under a kind of discipline, which they exercise among each other. They are generally seen to keep together in companies, to march in exact order, and to obey the voice of some particular chieftain remarkable for his size and gravity. One species of these which Mr. Buffon calls the OUARINE, and which are remarkable for the loudness and the distinctness of their voice, are still more so for the use to which they convert it. "I have frequently been a witness," says Margrave, "of their assemblies and deliberations. Every day, both morning and evening, the ouarines assemble in the woods to receive instructions. When all come together, one among the number takes the highest place on a tree, and makes a signal with his hand to the rest to sit round, in order to hearken. As soon as he sees them placed, he begins his discourse with so loud a voice, and yet in a manner so precipitate, that, to hear him at a distance, one would think the whole company were crying out at the same time: however, during that time, one only is speaking; and all the rest observe the most profound silence. When this has done, he makes a sign with the hand for the rest to reply; and at that instant they raise their voices together, until by another signal of the hand they are enjoined silence. This they as readily obey; till, at last, the whole assembly breaks up, after hearing a repetition of the same preachment."

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[16] Labat, Relat. de l'Afric. Occident. p. 317.

The chief food of the monkey tribe is fruits, the buds of trees, or succulent roots and plants. They all, like man, seem fond of sweets; and particularly the pleasant juice of the palm-tree and the sugar-cane. With these the fertile regions in which they are bred seldom fail to supply them; but when it happens that these fail, or that more nourishing food becomes more agreeable, they eat insects and worms: and sometimes, if near the coasts, descend to the sea-shore, where they eat oysters, crabs, and shell-fish. Their manner of managing an oyster is extraordinary enough; but it is too well attested to fail of our assent. As the oysters in the tropical climates are generally larger than with us, the monkeys, when they go to the sea-side, pick up a stone, and clap it between the opening shells; this prevents them from closing; and the monkey then eats the fish at his ease. They often also draw crabs from the water, by putting their tail to the hole where that animal takes refuge, and, the crab fastening upon it, they withdraw it with a jerk, and thus pull their prey upon shore. This habit of laying traps for other animals makes them very cautious of being entrapped themselves; and I am assured, by many persons of credit, that no snare, how nicely baited soever, will take the monkey of the West Indian islands; for having been accustomed to the cunning of man, it opposes its natural distrust to human artifice.

The monkey generally brings forth one at a time, and sometimes two. They are rarely found to breed when brought over into Europe; but of those that do, they exhibit a very striking picture of parental affection. The male and female are never tired of fondling their young one. They instruct it with no little assiduity; and often severely correct it, if stubborn, or disinclined to profit by their example: they hand it from one to the other; and when the male has done showing his regard, the female takes her turn. When wild in the woods, the female, if she happens to have two, carries one on her back, and the other in her arms: that on her back clings very closely, clasping its hands round her neck, and its feet about her middle: when she wants to suckle it, she then alters their position; and that which has been fed gives place to the other, which she takes in her arms. It often happens that she is unable to leap from one tree to another, when thus loaden; and upon such occasions their dexterity is very surprising. The whole family form a kind of chain, locking tail in tail, or hand in hand, and one of them holding the branch above, the rest swing down, balancing to and fro, like a pendulum, until the undermost is enabled to catch hold of the lower branches of some neighbouring tree. When the hold is fixed below, the monkey lets go that which was above, and thus comes undermost in turn; but, creeping up along the chain, attains the next branches, like the rest; and thus they all take possession of the tree, without ever coming to the ground.

When in a state of domestic tameness, those animals are very amusing, and often fill up a vacant hour, when other entertainment is wanting. There are few that are not acquainted with their various mimicries, and their capricious feats of activity. But it is generally in company with other animals of a more simple disposition, that their tricks and superior instincts are shown; they seem to take a delight in tormenting them; and I have seen one of them amusing itself for hours together imposing upon the gravity of a cat. Erasmus tells us of a large monkey, kept by Sir Thomas More, that, one day diverting itself in his garden, where some tame rabbits were kept, played several of his usual pranks among them, while the rabbits scarcely well knew what to make of their new acquaintance: in the mean time, a weasel, that came for very different purposes than those of entertainment, was seen peering about the place in which the rabbits were fed, and endeavouring to make its way, by removing a board that closed their hutch. While the monkey saw no danger, it continued a calm spectator of the enemy's efforts; but just when by long labour, the weasel had effected its purpose, and had removed the board, the monkey stept in, and, with the utmost dexterity, fastened it again in its place; and the disappointed weasel was too much fatigued to renew its operations. To this I will only add what Father Carli, in his history of Angola, assures us to be true. In that horrid country, where he went to convert the savage natives to Christianity, and met with nothing but distress and disappointment; while his health was totally impaired by the raging heats of the climate, his patience exhausted by the obstinacy of the stupid natives, and his little provisions daily plundered without redress, in such an exigency he found more faithful services from the monkeys than the men; these he had taught to attend him, to guard him whilst sleeping, against thieves and rats, to comb his head, to fetch his water; and he asserts, that they were even more tractable than the human inhabitants of the place. It is indeed remarkable, that in those countries where the men are most barbarous and stupid, the brutes are most active and sagacious. It is in the torrid tracts inhabited by barbarians, that such various animals are found with instinct so nearly approaching reason. The savages, both of Africa and America, accordingly suppose monkeys to be men: idle, slothful, rational beings; capable of speech and conversation; but obstinately dumb, for fear of being compelled to labour.

As of all savages, those of Africa are the most brutal, so, of all countries, the monkeys of Africa are the most expert and entertaining. The monkeys of America are, in general, neither so sagacious nor so tractable, nor is their form so nearly approaching that of man. The monkeys of the new continent may be very easily distinguished from those of the old, by three marks. Those of the ancient continent are universally found to have a naked callous substance behind, upon which they sit; which those of America are entirely without: those also of the ancient continent have the nostrils differently formed, more resembling those of men, the holes opening downward; whereas the American monkeys have them opening on each side; those of the ancient world have pouches on each side the jaw, into which they put their provisions; which those of America are without: lastly, none of the monkeys of the ancient continent hang by the tail, which many of the American sorts are known to do. By these marks the monkeys of either continent may be readily distinguished from each other, and prized accordingly. The African monkey, as I am assured, requires a longer education, and more correction, than that of America; but it is at last found capable of more various powers of imitation, and shows a greater degree of cunning and activity.

Mr. Buffon, who has examined this race of imitative beings with greater accuracy than any other naturalist before him, makes but nine species of monkeys belonging to the ancient continent; and eleven belonging to the new. To all these he gives the names which they go by in their respective countries; which, undoubtedly, is the method least liable to error, and the most proper for imitation.

Of the monkeys of the ancient continent, the first he describes is the MACAGUO; somewhat resembling a baboon in size, strength of body, and a hideous wrinkled visage: it differs, however, in having a very long tail, which is covered with tufted hair. It is a native of Congo.

The second is the PATAS, which is about the same size with the former; but differs in having a longer body, and a face less hideous: it is particularly remarkable for the colour of its hair, which is of a red, so brilliant, that the animal looks as if it were actually painted. It is usually brought from Senegal; and by some called the red African monkey.[17]

The third of the ancient continent is the MALBROUK;[18] of which he supposes the monkey which he calls the BONET CHINOIS to be a variety. The one is remarkable for a long tail, and long beard; the other for a cap of hair that covers the crown of the head, from whence it takes the name. Both are natives of the East Indies; and the Bramins, who extend their charity to all the brute creation, have hospitals for such of them as happen to be sick, or otherwise disabled.

The fourth of this kind is the MANGABEY; it may be distinguished from all others by its eyelids, which are naked, and of a striking whiteness. It is a native of Madagascar.[19]

The fifth is the MONA, or the CEPHUS of the ancients: it is distinguished by its colour, which is variegated with black and red; and its tail is of an ash colour, with two white spots on each side at its insertion. It is a native of the northern parts of Africa.[20]

The sixth is the CALLITRIX, or GREEN MONKEY of St. Iago, distinguished by its beautiful green colour on the back, its white breast and belly, and its black face.[21]

The seventh is the MOUSTOC, or WHITE NOSE; distinguished by the whiteness of its lips, from whence it has received its name, the rest of the face being of a deep blue. It is a native of the Gold Coast, and a very beautiful little animal.

The eighth is the TALAPOIN; and may be distinguished as well by its beautiful variety of green, white, and yellow hair, as by that under the eyes being of a greater length than the rest. It is supposed to be a native of Africa and the East.

The ninth and last of the monkeys of the ancient continent, is the DOUC, so called in Cochin-China, of which country it is a native. The douc seems to unite the characters of all the former together: with a long tail, like the monkey; of a size as large as the baboon; and with a flat face like the ape: it even resembles the American monkeys, in having no callosity on its posteriors. Thus it seems to form the shade by which the monkeys of one continent are linked with those of the other.

Next come the monkeys of the new continent; which, as has been said, differ from those of the old, in the make of their nostrils, in their having no callosity on their posteriors, and in their having no pouches on each side of the jaw. They differ also from each other, a part of them making no use of their tails to hang by; while others of them have the tail very strong and muscular, and serving by way of a fifth hand to hold by.[22] Those with muscular holding tails, are called

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[17] See Supplementary Note D, p. 493.

[18] See Ibid. [19] See Ibid. p. 494. [20] See Ibid.

[21] As this monkey is found in Cape de Verd islands and the neighbouring parts of Africa, it is one of a species most frequently imported into Europe.—ED.

[22] There are no apes or monkeys without a tail known in America, and but one species with a tail shorter than the body, which was lately discovered by Baron Humboldt.—ED.

SAPAJOUS; those with feeble useless tails, are called SAGOINS. Of the sapajous there are five sorts: of the sagoins there are six.

The first of the sapajous is the WARINE, or the BRAZILIAN GUARIBA. This monkey is as large as a fox, with long black hair, and remarkable for the loudness of its voice. It is the largest of the monkey kind to be found in America.

The second is the COATI; which may be distinguished from the rest by having no thumb, and consequently but four fingers on the two fore-paws. The tail, however, supplies the defects of the hand; and with this the animal slings itself from one tree to another, with surprising rapidity.

The third is the SAJOU; distinguished from the rest of the sapajous by its yellowish flesh-coloured face.

The fourth is the SAI. It is somewhat larger than the sajou, and has a broader muzzle. It is called also the BEWAILER, from its peculiar manner of lamenting when either threatened or beaten.

The fifth and last of the sapajou kind, or monkeys that hold by the tail, is the SAMARI, or AURORA; which is the smallest and most beautiful of all. It is of a fine orange colour, with two circles of flesh round the eyes. It is a very tender, delicate animal, and held in high price.

Of the sagoins with feeble tails there are six kinds. The first and the largest is the SAKI, or CAGUI; so remarkable for the length of the hair on its tail, that it has been often termed the FOX-TAILED MONKEY. It is of different sizes; some being twice as large as others.

The second of this kind is the TAMAIN; which is usually black, with the feet yellow. Some, however, are found all over brown, spotted with yellow.

The third is the WISTITI; remarkable for the large tufts of hair upon its face, and its annulated tail.[23]

The fourth is the MARIKINA; with a mane round the neck, and a bunch of hair at the end of the tail, like a lion.

The fifth is called the PINCH; with the face of a beautiful black, and white hair that descends on each side of the face, like that of man.

The last, least, and most beautiful of all, is the MICO, an animal too curiously adorned not to demand a particular description; which is thus given of it by Mr. Condamine:—"That," says he, "which the governor of Para made me a present of, was the only one of its kind that was seen in the country. The hair on its body was of a beautiful silver colour, brighter than that of the most venerable human hair; while the tail was of a deep brown, inclining to blackness. It had another singularity more remarkable than the former; its ears, its cheeks, and lips, were tinctured with so bright a vermilion, that one could scarcely be led to suppose that it was natural. I kept it a year; and it was still alive when I made this description of it, almost within sight of the coasts of France: all I could then do was to preserve it in spirits of wine, which might serve to keep it in such a state as to show that I did not in the least exaggerate in my description."

OF THE MAKI.

The last of the monkey kind are the makies, which have no other pretensions to be placed in this class, except that of having hands like the former, and making use of them to climb trees, or to pluck their food. Animals of the hare kind, indeed, are often seen to feed themselves with their fore-paws, but they can hold nothing in one of them singly, and are obliged to take up whatever they eat in both at once: but it is otherwise with the maki; as well as the monkey kinds, they seize their food with one hand, pretty much like a man, and grasp it with great ease and firmness. The maki, therefore, from this conformation in its hands both before and behind, approaches nearly to the monkey kind; but in other respects, such as the make of the snout, the form of the ears, and the parts that distinguish the sexes, it entirely differs from them. There are many different kinds of these animals; all varying from each other in colour or size, but agreeing in the human-like figure of their hands and feet, and in their long nose, which somewhat resembles that of a dog. As most of those are bred in the depths of the forest, we know little more concerning them than their figure. Their way of living, their power of pursuit and escape, can only be supposed, from the analogy of their conformation, somewhat to resemble those of the monkey.

The first of this kind is the MOCOCO; a beautiful animal, about the size of a common cat, but the body and limbs slenderer, and of a longer make. It has a very long tail, at least double the length of its body; it is covered with fur, and marked alternately with broad rings of black and white. But what it is chiefly remarkable for, besides the form of its hands and feet, is the largeness of its eyes, which are surrounded with a broad black space; and the length of the hinder legs, which by far exceed those before. When it sleeps, it brings its nose to its belly, and its tail over its head. When it plays, it uses a sort of galloping, with its tail raised over its back, which keeps continually in motion. The head is covered with dark ash-coloured hair; the back and sides with a red ash-colour, and not so dark as on the head; and the whole glossy, soft, and delicate, smooth to the touch, and standing almost upright like the pile of velvet. It is a native of Madagascar; appears to be a harmless gentle animal; and though it resembles the monkey in many respects, yet has neither its malice nor its mischief: nevertheless, like the monkey, it seems to be always in motion; and moves, like all four-handed animals, in an oblique direction.

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[23] See Supplementary Note D, p. 494.

A second of this kind, which is also a native of Madagascar, is the MONGOZ; which is less than the former; with a soft glossy robe, but a little curled. The nose also is thicker than that of the mococo; the eyes are black, with orange-coloured circles round the pupil; and the tail is of one uniform colour. As to the rest, it is found of various colours; some being black, others brown; and its actions somewhat resemble those of a monkey.

The VARI is much larger than either of the former; its hair is much longer, and it has a kind of ruff round the neck, consisting of very long hair, by which it may be easily distinguished from the rest. It differs also in its disposition, which is fierce and savage; as also in the loudness of its voice, which somewhat resembles the roaring of the lion. This also is a native of Madagascar.

To this tribe we may refer a little four-handed animal, of the island of Ceylon, which Mr. Buffon calls the LORI; very remarkable for the singularity of its figure. This is, of all other animals, the longest in proportion to its size; having nine vertebræ in the loins; whereas other quadrupeds have only seven.[24] The body appears still the longer by having no tail. In other respects, it resembles those of the maki kind; as well in its hands and feet, as in its snout, and in the glossy qualities of its hair. It is about the size of a squirrel; and appears to be a tame, harmless little animal.[25]

OF THE OPOSSUM, AND ITS KINDS.

To these four-handed animals of the ancient continent, we may add the four-handed animals of the new, that use their hands like the former, as well as their tails, and that fill up the chasm between the monkey tribe and the lower orders of the forest. As the maki kind in some measure seem to unite the fox and the monkey in their figure and size, so these seem to unite the monkey and the rat. They are all less than the former; they have long tails, almost bare of hair; and their fur, as well as their shape, seems to place them near the rat kind. Some have accordingly ranked them in that class; but their being four-handed is a sufficient reason for placing them in the rear of the monkeys.

The first and the most remarkable of this tribe is the OPOSSUM, an animal found both in North and South America, of the size of a small cat. The head resembles that of a fox; it has fifty teeth in all, but two great ones in the midst like those of a rat. The eyes are little, round, clear, lively, and placed upright; the ears are long, broad, and transparent, like those of the rat kind; its tail also increases the similitude, being round, long, a little hairy in the beginning, but quite naked towards the end. The fore-legs are short, being about three inches long; while those behind are about four. The feet are like hands, each having five toes or fingers with white crooked nails, and rather longer behind than before. But it is particular in this animal, that the thumb on the hinder legs wants a nail; whereas the fingers are furnished with clawed nails as usual.

But that which distinguishes this animal from all others, and what has excited the wonder of mankind for more than two centuries, is the extraordinary conformation of its belly, as it is found to have a false womb, into which the young, when brought forth in the usual manner, creep, and continue for some days longer, to lodge and suckle securely.[26] This bag, if we may so call it, being one of the most extraordinary things in natural history, requires a more minute description. Under the belly of the female is a kind of slit or opening, of about three inches long; this opening is composed of a skin, which makes a bag internally, that is covered on the inside with hair, and in this bag are the teats of the female; and into it the young, when brought forth, retire either to suckle or to escape from danger. This bag has a power of opening and shutting, at the will of the animal; and this is performed by means of several muscles, and two bones, that are fitted for this purpose, and that are peculiar to this animal only. These bones are placed before the *os pubis*, to which they are joined at the base; they are about two inches long, and grow smaller and smaller to their extremities. These support the muscles that serve to open the bag, and give them a fixture. To these muscles there are antagonists, that serve in the same manner to shut the bag; and this they perform so exactly, that in the living animal the opening can scarcely be discerned, except when the sides are forcibly drawn asunder. The inside of this bag is furnished with glands that exude a musky substance, which communicates to the flesh of the animal, and renders it unfit to be eaten. It is not to be supposed that this is the place where the young are conceived, as some have been led to imagine; for the opossum has another womb, like that of the generality of animals, in which generation is performed in the ordinary manner. The bag we have been describing may rather be considered as a supplemental womb. In the real womb, the little animal is partly brought to perfection: in the ordinary one, it receives a kind of additional incubation; and acquires, at last, strength enough to follow the dam wherever she goes. We have many reasons to suppose that the young of this animal are all brought forth prematurely, or before they have acquired that degree of perfection which is common in other quadrupeds. The little ones, when first produced, are in a manner but half completed; and some travellers assert, that they are at that time not much larger than flies. We are assured also, that immediately on quitting the real womb they creep into the false one; where they continue fixed to the teat, until they have strength sufficient to venture once more into the open air, and share the fatigues of the parent. Ulloa assures us, that he has found five of these little creatures hidden in the belly of the dam three days after she was dead, still alive, and all clinging to the teat with great avidity. It is probable, therefore, that upon their first entering the false womb, they seldom stir out from thence; but when more advanced, they venture forth several times in the day, and at last seldom make use of their retreat, except in cases of necessity or danger. Travellers are not agreed in their accounts of the time which these animals take to continue in the false womb; some assure us they remain there for several weeks; and others, more precisely, mention a month. During this period of strange gestation there is no difficulty in opening the bag in which they are concealed; they may be reckoned, examined, and handled, without much inconvenience; for they keep fixed to the teat, and cling there as firm as if they made a part of the body of the animal that bears them. When they are grown stronger, they drop from the teat into the bag in which they are contained; and at last find their way out, in search of more copious subsistence. Still, however, the false belly serves them for a retreat, either when they want to sleep or to suckle, or when they are pursued by an enemy. The dam, on such occasions, opens her bag to receive them, which they enter,

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[24] Buffon, vol. xxvi. p. 274.

[25] See Supplementary Note E, p. 495.

[26] See Supplementary Note F, p. 495.

> ———— Pars formidine turpi
> Scandunt rursus equum et nota conduntur in alvo.

The opossum, when on the ground, is a slow, helpless animal; the formation of its hands is alone sufficient to show its incapacity of running with any degree of swiftness; but, to counterbalance this inconvenience, it climbs trees with great ease and expedition.[27] It chiefly subsists upon birds; and hides among the leaves of the trees to seize them by surprise. It often also hangs by the tail, which is long and muscular; and in this situation, for hours together, with the head downwards, it keeps watching for its prey. If any lesser animal, which it is able to overcome, passes underneath, it drops upon it with deadly aim, and quickly devours it. By means of its tail, the opossum also slings from one tree to another, hunts insects, escapes its pursuers, and provides for its safety. It seems to be a creature that lives upon vegetables, as well as animal substances, roots, sugar-canes, the bark, and even the leaves of trees. It is easily tamed, but it is a disagreeable domestic, as well from its stupidity and figure as its scent, which, however fragrant in small quantities, fails not to be ungrateful when copiously supplied.[28]

An animal greatly resembling the former,[29] is the MARMOSE, which is found in the same continent. It seems only to differ in size, being less; and, instead of a bag to receive its young, has only two longitudinal folds near the thighs, within which the young, which are prematurely brought forth, as in the last instance, continue to suckle. The young of these, when first produced, are not above the size of a bean; but continue sticking to the teat until they have arrived at greater maturity.

The CAYOPOLIN is somewhat larger than the former, and a good deal resembling it in habits and figure, except that its snout is more pointed, its tail longer in proportion, and its colour different, being of an ash, somewhat inclining to yellow; however, I should suppose it to be only a variety of the former.

To this number we may add the PHILANGER, so called by Mr. Buffon; a good deal resembling the former, but distinguished by the fashion of its hinder hands; the thumb and fore-finger being joined together, except at the extremities.[30] This animal is about the size of a rat, and has, accordingly, by some, been called the rat of Surinam.

The last animal of this class is called, by Mr. Buffon, the TARSIER. This extraordinary little animal resembles the former, in having four hands and a long tail; but it differs very much in the extreme length of its hinder legs, which are longer than the rest of its whole body. The bones of that part of the foot called the *tarsus*, are likewise so very long, that from thence the animal has received its name: the tail is naked in the middle, and hairy only at both extremities; its hair is woolly, soft, and of a deep ash-colour. As to the rest, it is unknown from what country this animal was brought; but the naturalist from whom we have its description, supposes it to be a native of America.

From this general description of four-handed animals, we perceive what few advantages the brute creation derive from those organs, that, in man, are employed to so many great and useful purposes. The being able to pluck their food from the trees, the capacity of clinging among the branches, and at most of converting one of those branches into a weapon of offence, are the highest stretches of their sagacity, and the only use their hands have hitherto been employed in; and yet some superficial men have asserted, that the hands alone are sufficient to vindicate the dominion of mankind over other animals; and that much of his boasted reason is nothing more than the result of his happier conformation: however, were this so, an ape or a monkey would, in some instances, be more rational than we; their fingers are smaller, and, in some of them, more finely formed than ours. To what a variety of purposes might they not be employed, if their powers were properly exerted! Those works which we, from the largeness of our fingers, are obliged to go clumsily about, one of these could very easily perform with the utmost exactness; and if the fineness of the hand assisted reason, an ape would be one of the most reasonable beings in the creation. But these admirably formed machines are almost useless both to mankind and themselves; and contribute little more to the happiness of animal life than the paws of the lowest quadruped. They are supplied, indeed, with the organs; but they want the mind to put them into action: it is that reasoning principle alone, with which man has been endowed, that can adapt seemingly opposite causes to concur in the same general design; and even where the organs are deficient, that can supply their place, by the intervention of assisting instruments. Where reason prevails, we find that it scarcely matters what the organs are that give it the direction; the being furnished with that principle still goes forward steadily, and uniformly successful; breaks through every obstacle, and becomes master of every enterprise. I have seen a man without hands or legs convert, by practice, his very stumps to the most convenient purposes; and with these clumsy instruments perform the most astonishing feats of dexterity. We may, therefore, conclude that it is the mind alone that gives a master to the creation; and that, if a bear or a horse were endowed with the same intellects that have been given to man, the hardness of a hoof, or the awkwardness of a paw, would be no obstacle to their advancement in the arts of dominion, or of social felicity.

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[27] Buffon, vol. xxi. p. 174.

[28] An animal nearly allied to the opossum is the kangaroo of New Holland, which will be found described in a succeeding chapter.—ED.

[29] Buffon, vol. xxi. p. 212.

[30] See Supplementary Note G, p. 497.

Note A.—*Of Monkeys in general.*

Monkeys form by far the greatest portion of the quadrumana; all the other animals of that order being comprehended, or rather confounded, in a distinct family under the name of lemurs, from the rightful owners of which appellation many of them differ most essentially. In addition to the hands on the posterior as well as anterior members, with long and flexible fingers, and opposible thumbs, which constitute the primary characters of the order, the monkey tribe in general is distinguished by the following peculiarities. Their incisor teeth are invariably four in each jaw, and their molars, like those of man, are flat and surmounted by blunted tubercles. The latter are five in number on each side of either jaw, in all the monkeys of the Old continent, and in one very distinct tribe belonging to the New; but most of the American species are furnished with a sixth. Their canines vary considerably in size, from a trifling projection beyond the remaining teeth to a long and powerful tusk, almost equalling those of the most formidable carnivora; and from this structure it necessarily follows that a vacant space is left between the incisors and the canines of the upper jaw, and between the canines and the molars of the lower, for the reception and lodgment of those organs when the mouth is closed. The nails of all their fingers, as well as those of the thumbs, are invariably flat and expanded.

In almost every other point they are subject to infinite variations of form and structure. The shape of the head, which, in one or two species, offers a close approximation to the human form, passes through numerous intermediate gradations, until it reaches a point at which it can only be compared with that of the hound. The body, which is in general slight and well made, is in some few instances remarkably short and thickset, and in others drawn out to a surprising degree of tenuity. Their limbs vary greatly in their proportions; but in most of them the anterior are longer than the posterior; in all they are admirably adapted to the purposes to which they are applied, in climbing and leaping, by the slenderness of their form, the flexibility of their joints, and the muscular activity with which these qualities are so strikingly combined. But of all their organs there is perhaps none which exhibits so remarkable a discrepancy in every particular as the tail; which is entirely wanting in some, forms a mere tubercle in others, in a third group is short and tapering, in a fourth of moderate length and cylindrical, in a fifth extremely long, but uniformly covered with hair; in others, again, of equal length, divested of hair beneath and near the tip, and capable of being twisted round the branch of a tree or any other similar substance in such a manner as to support the whole weight of the animal, even without the assistance of his hands.

In none of them, it may be observed, are the hands formed for swimming, or the nails constructed for digging the earth; and in none of them is the naked callous portion, which corresponds to the sole or the palm, capable of being applied, like the feet of man or of the bear, to the flat surfaces on which they may occasionally tread. Even in those which have the greatest propensity to assume an upright posture, the body is, under such circumstances, wholly supported by the outer margins of the posterior hands. The earth, in fact, is not their proper place of abode; they are essentially inhabitants of trees, and every part of their organization is admirably fitted for the mode of life to which they are destined by the hand of nature herself. Throughout the vast forests of Asia, Africa, and South America, and more especially in those portions of the three continents which are comprehended within the tropics, they congregate in numerous troops, bounding rapidly from branch to branch, and from tree to tree, in search of the fruits and eggs which constitute their principal means of subsistence. In the course of these peregrinations, which are frequently executed with a velocity scarcely to be followed by the eye, they seem to give a momentary, and but a momentary, attention to every remarkable object that falls in their way, but never appear to remember it again; for they will examine the same object with the same rapidity as often as it recurs, and apparently without in the least recognising it as that which they had seen before. They pass on a sudden from a state of seeming tranquillity to the most violent demonstrations of passion and sensuality; and in the course of a few minutes run through all the various phases of gesture and action of which they are capable, and for which their peculiar formation affords ample scope. The females treat their young with the greatest tenderness until they become capable of shifting for themselves; when they turn them loose upon the world, and conduct themselves towards them from that time forwards in the same manner as towards the most perfect strangers.

The degrees of their so much vaunted intelligence, which is in general very limited, and rarely capable of being made subservient to the purposes of man, vary almost as much as the ever-changing outline of their form. From the grave and reflective oran-outang, whose docility and powers of imitation in his young state have been the theme of so much ridiculous exaggeration and sophistical argumentation, to the stupid and savage baboon, whose gross brutality is scarcely relieved by a single spark of intelligence, the gradations are regular and easy. A remarkable circumstance connected with the development of this faculty, or perhaps we should rather say, with its gradual extinction, consists in the fact that it is only in young animals which have not yet attained their full growth, that it is capable of being brought into play; the older individuals, even of the most tractable races, entirely losing the gaiety, and with it the docility, of their youth, and becoming at length as stupid and as savage as the most barbarous of the tribe.

The monkeys of the Old and of the New world differ from each other in several remarkable points, some of which are universally characteristic of all the species of each, while others, although affording good and tangible means of discrimination, are but partially applicable. Thus the nostrils of all the species inhabiting the Old world are anterior, like those of man, and divided only by a narrow septum. In those of the New world, on the contrary, they are invariably separated by a broad division, and consequently occupy a position more or less lateral. In the former again the molar teeth are uniformly five in number, crowned with obtuse and flattened tubercles; while in the latter they are either six in number, or in the few anomalous cases in which they are limited to five, and which are peculiar to a group that ought to occupy an intermediate station between the monkeys and the insect-eating carnivora, their crowns are surmounted by sharp and somewhat elevated points. The tails of all the American monkeys are of great length, but they differ more or less from each other in the power of suspending themselves by means of that organ, a faculty which is nevertheless common to the greater number of them, and of which those of the Old world are entirely destitute. On the other hand, the American species never exhibit any traces of the callosities or of the cheek-pouches, which are so common among the Asiatic and African races.

Each of these grand divisions has been subdivided into several minor groups or genera; but zoologists have hitherto been by no means unanimous with respect to the principles on which this subdivision ought to be effected. The arrangement which appears to be most generally adopted at the present day is that of M. Cuvier and M. Geoffroy-Saint-Hilaire, which is essentially founded on the application of an imaginary rule, first employed by Camper for ascertaining the degree of intelligence, and consequently of ideal beauty, expressed by the human face in its various gradations of elevation or debasement, and called by him the facial angle. Unfortunately, however, the operations of nature in the animal creation can never be subjected to geometrical laws; nor can her innumerable phases be expressed with the precision of a mathematical theorem. This assumed point of comparison varies almost indefinitely not merely in different species, but even in the same individual; and the oran-outang himself, who is supposed to approach most nearly to the human form, offers the most striking illustration of the truth of this observation; inasmuch as in his young and intellectual state his facial angle is equal to 65°, while in his aged and debased condition, in which he has actually been repeatedly described as a different animal under the name of Pongo, it sinks below 30°; degrading him even beneath the level of the most savage and stupid of the baboons.

In the foregoing observations we may be perhaps considered as giving too much space to the generalities of the subject; an objection to which we can only answer that nearly the whole of our knowledge of the monkey tribe consists in generalities. Of the great number of species, upwards of one hundred of which are now known and characterized, very few are distinguished from their immediate fellows by striking and strongly-marked characters, either physical or moral. The groups too are connected by such gradual and easy transitions, that although the typical forms of each, isolated from the mass and placed in contrast with each other, unquestionably exhibit many broadly distinguishing peculiarities, yet the entire series offers a chain so nearly complete and unbroken as scarcely to admit of being treated of in any other way than as one homogeneous whole.

NOTE B.—*The Oran-outang.*

Naturalists are now inclined to suspect that what has hitherto been described in Europe as the oran-outang, is in fact a young pongo—an ape of great strength and size. The most recent and most remarkable capture of the pongo or great oran-outang is recorded by Dr. Clarke Abel, in the fifteenth volume of the 'Asiatic Researches.' Dr. Clarke Abel's attention was originally directed to the subject by the following notice in the 'Hurkara Newspaper,' communicated to that journal by one of the individuals concerned in the onslaught. "A party having landed on the north coast of Sumatra, from the Mary-Anne Sophia, Captain Cornfoot, for the purpose of watering, fell in with an animal of the monkey species of a most gigantic size. It was upwards of seven feet in height; and, after receiving seven shots, was killed. After the fifth shot, it climbed a tree, and reclined against its boughs, to all appearance in great pain, and vomited a considerable quantity of blood. Its lower jaw, and the skin of the back and arms, which are brought round to Calcutta, I have seen. Some of the teeth of the upper jaw have also arrived here, and are about to be deposited in the museum of the Asiatic Society. There are some of them about three inches long. The lower jaw is immense: and the skin, to which I have before referred, is so large, that although cut off from the wrists, each arm is now considerably longer than mine, and I am a man not a quarter of an inch under six feet. The back is remarkably broad, and is covered with long coarse brown hair. When the animal made its appearance, it seemed as if it had come from some distance; and to all appearance it had been walking through a swamp, its legs up to the knees being muddy. Its gait was slovenly, and as it went it waddled from side to side."

Dr. Abel adds the following additional information, obtained through direct oral communication with Captain Cornfoot. "This formidable animal was more than a head taller than the tallest man on board, even in an ordinary standing posture, and it measured eight feet in height when suspended for the purpose of being skinned. The form and arrangement of its beard was beautiful; there was a great deal of the human expression in its countenance, and its piteous actions when wounded, and great tenacity of life, rendered the scene tragical and affecting. On the spot where he was killed, there were five or six tall trees which greatly prolonged the combat; for so great was his strength and agility in bounding from branch to branch, that his pursuers were unable to take a determinate aim, until they had felled all the trees but one. Even then he did not yield himself to his antagonists till he had received five balls, and been moreover thrust through with a spear. One of the first balls appears to have penetrated his lungs, for he was observed immediately to sling himself by his feet from a branch, with his head downwards, so as to allow the blood to flow from his mouth. On receiving a wound, he always put his hand over the injured part, and distressed his pursuers by the human-like agony of his expression. When on the ground, after being exhausted by his many wounds, he lay as if dead, with his head resting on his folded arms. It was at this moment that an officer attempted to give him the *coup-de-grace* by pushing a spear through his body, but he immediately jumped on his feet, wrested the weapon from his antagonist, and shivered it in pieces. This was his last wound, and his last great exertion; yet he lived some time afterwards, and drank, it is stated, great quantities of water. Captain Cornfoot also observes, that the animal had probably travelled some distance to the place where he was killed, as his legs were covered with mud up to the knees."

The countenance of this tremendous creature, with the exception of the beard, was nearly bare, a few short downy hairs being alone scattered over it. It was of a dark lead colour, excepting the margins of the lips, which were paler. The eyes were small, in relation to those of man, and about an inch apart. The eyelids were well fringed with lashes. The ears were comparatively very small, being not more than an inch and a half long, and barely an inch in breadth. They lay close to the head, and resembled those of the human race, with the exception of the lower lobe, which was wanting. The nose scarcely rose above the level of the face, and the nostrils were three-fourths of an inch in breadth, and were placed obliquely side by side. The muzzle was projecting, and the opening of the mouth very large. The lips appeared narrow when closed, but were, in reality, half an inch in thickness. The hair of the head was of a reddish brown colour; it grew from behind forwards, and measured five inches in length. The beard was handsome, and appeared to have been curly during the lifetime of the animal. Its colour was lighter than the hair of the head, and approached a light chestnut. The beard was about three inches long, and sprung very gracefully from the upper lip, near the angles of the mouth, in the form of mustachios, from whence descending, it clothed the chin. The palms of the hands were of great length, and naked from the wrists. Their backs were covered with hair which was sparse upon the fingers. This hair inclined backwards towards the wrists, and then turned directly upwards. All the fingers were terminated by strong, black, convex nails. The thumb reached to the first joint of the forefinger. The soles of the feet were bare; the feet were covered on the back with long brown hair, as far as the last joint of the toes. The great toe was set on nearly at right angles to the foot, and was relatively very short. The general colour of the skin of this animal was a dark lead. The hair was of a brownish red, varying in some places to a blackish hue, but appearing red under a stronger light. It was on all parts very long directed, upwards on the fore arm, but from the upper arm it hung down loose and shaggy. It was equally long and full upon the flanks, but was more scantily spread over the chest and fore part of the body. The extended arms of this woodland giant were capable of embracing a span of eight feet two inches. His height, according to the measurements of Dr. Abel, may have exceeded, but could not have been less than, seven feet six inches and a half.

Dr. Clarke Abel has given the following interesting account of an oran-outang which he brought from Java to England. "On board ship an attempt being made to secure him by a chain tied to a strong staple, he instantly unfastened it, and ran off with the chain dragging behind; but finding himself embarrassed by its length, he coiled it once or twice, and threw it over his shoulder. This feat he often repeated; and when he found that it would not remain on his shoulder, he took it into his mouth. After several abortive attempts to secure him more effectually, he was allowed to wander freely about the ship, and soon became familiar with the sailors, and surpassed them in agility. They often chased him about the rigging, and gave him frequent opportunities of displaying his adroitness in managing an escape. On first starting, he would endeavour to outstrip his pursuers by mere speed; but when much pressed, eluded them by seizing a loose rope, and swinging out of their reach. At other times he would patiently wait on the shrouds or at the mast-head, till his pursuers almost touched him, and then suddenly lower himself to the deck by any rope that was near him, or bound along the main-stay from one mast to the other, swinging by his hands, and moving them one over the other. The men would often shake the ropes by which he clung with so much violence, as to make me fear his falling; but I soon found that the power of his muscles could not be easily overcome. When in a playful humour, he would often swing within arm's length of his pursuer, and, having struck him with his hand, throw himself from him. Whilst in Java he lodged in a large tamarind-tree near my dwelling, and formed a bed by intertwining the small branches, and covering them with leaves. During the day, he would lie with his head projecting beyond his nest, watching whoever might pass under; and when he saw any one with fruit, would descend to obtain a share of it. He always retired for the night at sunset, or sooner if he had been well fed, and rose with the sun, and visited those from whom he habitually received food.

"Of some small monkeys on board from Java he took little notice, whilst under the observation of the persons of the ship. Once, indeed, he openly attempted to throw a small cage containing three of them overboard; because, probably, he had seen them receive food of which he could obtain no part. But although he held so little intercourse with them when under our inspection, I had reason to suspect that he was less indifferent to their society when free from our observation; and was one day summoned to the top gallant-yard of the mizen-mast to overlook him playing with a young male monkey. Lying on his back, partially covered with a sail, he for some time contemplated, with great gravity, the gambols of the monkey, which bounded over him: but at length caught him by the tail, and tried to envelop him in his covering. The monkey seemed to dislike his confinement, and broke from him, but again renewed its gambols, and although frequently caught, always escaped. The intercourse, however, did not seem to be that of equals, for the oran-outang never condescended to romp with the monkey, as he did with the boys of the ship. Yet the monkeys had evidently a great predilection for his company; for whenever they broke loose, they took their way to his resting-place, and were often seen lurking about it, or creeping clandestinely towards him. There appeared to be no gradation in their intimacy: as they appeared as confidently familiar with him when first observed, as at the close of their acquaintance. But although so gentle when not exceedingly irritated, the oran-outang could be excited to violent rage, which he expressed by opening his mouth, showing his teeth, and seizing and biting those who were near him. Sometimes, indeed, he seemed almost driven to desperation: and, on two or three occasions, committed an act, which in a rational being, would have been called the threatening of suicide. If repeatedly refused an orange when he attempted to take it, he would shriek violently, and swing furiously about the ropes; then return and endeavour to obtain it: if again refused, he would roll for some time like an angry child upon the deck, uttering the most piercing screams; and then suddenly starting up, rush furiously over the side of the ship and disappear. On first witnessing this act, we thought that he had thrown himself into the sea; but, on a search being made, found him concealed under the chains.

"This animal neither practises the grimaces and antics of other monkeys, nor possesses their perpetual proneness to mischief. Gravity, approaching to melancholy, and mildness, were sometimes strongly expressed in his countenance, and seem to be the characteristics of his disposition. When he first came among strangers, he would sit for hours with his hand upon his head, looking pensively at all around him; and when much incommoded by their examination, would hide himself beneath any covering that was at hand. His mildness was evinced by his forbearance under injuries, which were grievous before he was excited to revenge: but he always avoided those who often teased him. He soon became strongly attached to those who kindly used him. By their side he was fond of sitting; and getting as close as possible to their persons, would take their hands between his lips, and fly to them for protection. From the boatswain of the Alceste, who shared his meals with him, and was his chief favourite, although he sometimes purloined the grog and the biscuit of his benefactor, he learned to eat with a spoon; and might be often seen sitting at his cabin door, enjoying his coffee, quite unembarrassed by those who observed him, and with a grotesque and sober air, that seemed a burlesque on human nature. Next to the boatswain, I was, perhaps, his most intimate acquaintance. He would always follow me to the mast-head, where I often went for the sake of reading apart from the noise of the ship; and, having satisfied himself that my pockets contained no eatables, would lie down by my side, and pulling a topsail entirely over him, peep from it occasionally to watch my movements. His favourite amusement in Java, was in swinging from the branches of trees, in passing from one to another, and in climbing over the roofs of houses; on board, in hanging by his arms from the ropes, and in romping with the boys of the ship. He would entice them into play, by striking them with his hand as they passed, and bounding from them, but allowing them to overtake him, and engage in a mock scuffle, in which he used his hands, feet, and mouth. If any conjecture could be formed from these frolics of his mode of attacking the adversary, it would appear to be his first object to throw him down, then to secure him with his hands and feet, and then wound him with his teeth.

"On board ship he commonly slept at the mast-head, after wrapping himself in a sail. In making his bed he used the greatest pains to remove every thing out of the way that might render the surface on which he intended to lie uneven: and, having satisfied himself with this part of his arrangement, spread out the sail, and lying down upon it on his back, drew it over his body. Sometimes I pre-occupied his bed, and teased him by refusing to give it up. On these occasions he would endeavour to pull the sail from under me, or to force me from it, and would not rest till I had resigned it. If it were large enough for both, he would quietly lie by my side. If all the sails happened to be set, he would hunt about for some other covering, and either steal one of the sailors' jackets or shirts that happened to be drying, or empty a hammock of its blankets. Off the Cape of Good-Hope he suffered much from a low temperature, especially early in the morning, when he would descend from the mast, shuddering with cold, and running up to any one of his friends, climb into their arms, and clasping them closely, derive warmth from their persons, screaming violently at any attempt to remove him. His food in Java was chiefly fruit, especially mangostans, of which he was extremely fond. He also sucked eggs with voracity, and often employed himself in seeking them. On board ship his diet was of no definite kind. He eat readily of all kinds of meat, and especially raw meat; was very fond of bread, but always preferred fruits when he could obtain them. His beverage in Java was water; on board ship it was as diversified as his food. He preferred coffee and tea, but would readily take wine, and exemplified his attachment to spirits by stealing the captain's brandy bottle. Since his arrival in London he has preferred beer and milk to any thing else, but drinks wine and other liquors.

"In his attempts to obtain food, he afforded us many opportunities of judging of his sagacity and disposition. He was always very impatient to seize it when held out to him, and became passionate when it was not soon given up; and would chase a person all over the ship to obtain it. I seldom came upon deck without sweetmeats or fruit in my pocket, and could never escape his vigilant eye. Sometimes I endeavoured to evade him by ascending to the mast-head, but was always overtaken or intercepted in my progress. When he came up with me on the shrouds, he would secure himself by one foot to the ratlings, and confine my legs with the other and one of his hands, while he rifled my pockets. If he found it impossible to overtake me, he would climb to a considerable height on the loose rigging, and then drop suddenly upon me. Or if, perceiving his intention, I attempted to descend, he would slide down a rope, and meet me at the bottom of the shrouds. Sometimes I fastened an orange to the end of a rope, and lowered it to the deck from the mast-head; and as soon as he attempted to seize it drew it rapidly up. After being several times foiled in endeavouring to obtain it by direct means, he altered his plan. Appearing to care little about it, he would remove to some distance, and ascend the rigging very leisurely for some time, and then, by a sudden spring, catch the rope which held it. If defeated again by my suddenly jerking the rope, he would at first seem quite in despair, relinquish his effort, and rush about the rigging, screaming violently. But he would always return, and again seizing the rope, disregard the jerk, and allow it to run through his hand till within reach of the orange; but if again foiled, would come to my side, and taking me by the arm, confine it while he hauled the orange up. I have seen him exhibit violent alarm on two occasions only, when he appeared to seek for safety in gaining as high an elevation as possible. On seeing eight large turtles brought on board, whilst the Cæsar was off the Island of Ascension, he climbed with all possible speed to a higher part of the ship than he had ever before reached, and, looking down upon them, projected his long lips into the form of a hog's snout, uttering at the same time a sound which might be described as between the croaking of a frog and the grunting of a pig. After some time he ventured to descend, but with great caution, peeping continually at the turtle, but could not be induced to approach within many yards of them. He ran to the same height, and uttered the same sounds, on seeing some men bathing and splashing in the sea; and since his arrival in England has shown nearly the same degree of fear at the sight of a live tortoise."

This animal survived his transportation to this country from August 1817, when he arrived, to the

1st April, 1819, during which interval he was in the custody of Mr. Cross at Exeter Change, as much caressed for the gentleness of his disposition as he was noticed for his great rarity. There was no need of personal confinement, and little of restraint or coercion; to his keepers especially, and to those whom he knew by their frequent visits, he displayed a decided partiality. During his last illness, and at his death, his piteous appearance, which seemed to bespeak his entreaties to those about him for relief, did not fail to excite the feelings of all who witnessed them, an excitement evidently heightened by the recollection of human suffering under similar circumstances, which the sight of this animal so strongly brought to mind. He was shedding his teeth at the period of his death, which was probably promoted, if not caused by it. This was sufficient evidence of his nonage, and as he increased both in stature and general bulk during his residence here, this individual may be said to support the conjecture that the adult oran-outang is no other than the pongo.

Note C.—*The Gibbons.*

The gibbon, simia lar of Linnæus, is distinguished, in common with other gibbons, by the enormous length of the anterior extremities. The arms, when the animal stands erect, very nearly touch the ground. The eyes are large and deeply seated; the nose is flat, and the ears are not unlike the human. A circle of gray hairs passes over the eyes, cheeks, and under the lower jaw, which completely surrounds the visage, and gives a very singular appearance to this animal. The hair on the back of the hands and feet is gray; in all other parts of the animal it is black. The gibbon has not been found exceeding four feet in height. The disposition of this species is said to be gentle. It receives its food—which consists chiefly of fruits, almonds, &c.—without greediness and without impatience. It suffers much from cold and from a low temperature, and seldom survives long removal from its native country. It is most commonly found on the coasts of Coromandel, on the peninsula of Malacca, and in the Molucca islands.

The ash-coloured gibbon, or wou-wou, differs little from the simia lar, except in colour. The arms are said to be longer, and the posterior callosities larger than those of the black gibbon.

There is also a species called the little gibbon, about one-third less than the great gibbon, but it has precisely the same form and proportions. The face is surrounded with gray hairs, forming a circle different in shape from that of the larger species. The top or crown of the head is blacker than the body. It has a small beard and whiskers.

Another species of the long-armed apes, is the siamang. The general description of this gibbon accords with that of the others of this sub-division of the apes. The first and second fingers of the hinder extremities are united as far as the middle of the second phalanx; the colour is black all over, without the white circle about the face; it has two loose naked folds of skin on the throat which are occasionally inflated. The hair is long and soft; but the face is without any, as are also the breasts of the female. The orbits of the eye are circular and remarkably prominent, and the canine teeth are long. These animals are very common in Sumatra. They are generally found assembled in large troops, conducted, as it is said, by a chief, whom the Malays believe to be invulnerable. Thus assembled at sunrise and again at sunset, they vie with each other in making the most dreadful cries, perfectly stunning to those accustomed to them, and frightful in the highest degree to strangers. Their powers of voice are doubtless increased by the guttural cavity before alluded to, analogous to a similar apparatus found in the howling monkeys of America. At all other times they appear to be perfectly quiet, so long at least as they are undisturbed.

Another species or variety is the active gibbon, which is distinguished, from the gibbon of Sumatra—in which island, however, this also is found—by its greater degree of activity, particularly in a state of nature. It is nearly three feet in height. The face is naked, of a very dark blue colour, and lightly tinted with brown in the female; the eyes are near each other, and sunken; and the muzzle is remarkably prominent. The nose is not so flat as that of the siamang, and the nostrils are large and open laterally. The chin is furnished with a few black hairs. The ears are nearly hidden by the long hair around them, and there is a white band round the upper part of the face. The colour of this species seems to vary in different individuals and sexes, and in the same individual at different periods; but brown, with various shades, appears the prevailing tint. The active gibbon is not gregarious like the siamang, but is generally found only with its female. It springs from tree to tree with wonderful agility, and can therefore but seldom be taken alive.—*Abridged from Supplement to the English edition of Cuvier's Animal Kingdom.*

Note D.—*The Monkey family.*

The red monkey of Pennant, the patas of Buffon and the French writers, is well-distinguished from all the other species by its peculiar colour and the singularity of its markings. The whole of the upper surface of its head, which is broad and flat, is of a deep rufous brown, which becomes lighter and assumes a rustier tinge on the back and on the outer sides of the limbs, and is continued along the tail until it is lost in the yellowish gray which terminates that organ. A patch of short dusky black hairs occupies the extremities of the nose, and extends upwards in a narrow line to the middle of the forehead, where it joins a series of long stiff coal-black hairs, forming an arch over each of the eyes, and separating the livid flesh-colour of the orbits and anterior part of the face from the red hairs which clothe the scalp. This double arch terminates in a somewhat expanded patch above the outer angles of the eyes. The sides of the upper lip are edged with a narrow line of the same short dusky hairs which cover the nose. Beneath the ears—which are blackish and moderately large—the hair forms broad thick bushy tufts of a light gray, which advance forwards upon the sides of the cheeks and lower jaw, so as to limit the naked part of the face to a narrow space between the eyes and the upper lip. From these tufts the hair is continued of the same colour on the whole of the under surface of the body, and on the inner sides of the limbs. The hands are dusky brown, with very short fingers, the thumb of the fore-hand especially being reduced almost to a mere tubercle. The facial angle is moderately elongated, and the nose flattened. The body measures about sixteen inches in length, and the tail is nearly equal.

The malbrouk is one of the largest of the guenon tribe. From muzzle to tail it is about a foot and a half in length. In walking on the earth he always supports himself on his four hands, but as he is essentially organized for the purposes of climbing and living in trees, his movements on the ground possess neither firmness nor facility. His hinder limbs being longer than the fore, the motion of the anterior part of his body cannot correspond to that of the posterior, the latter proceeding with the greater rapidity. This obliges him to carry the hinder parts sometimes to the right, and sometimes to the left, when he intends a slow motion, and to shoot forward by jumps when he is desirous to run. This conformation, so unfavourable for animals designed to live on earth, is peculiarly advantageous for such as are sustained on fruits. The disproportioned length of the hinder limbs in comparison of the fore, is no impediment to climbing, but imparts on the contrary a wonderful degree of agility in shooting from branch to branch, and even from tree to tree. Accordingly, we find that these monkeys rarely descend to the earth. Assembled in troops, they dwell for the most part in those capacious canopies of verdant foliage which cover the rich forests of Southern Asia, fellow-citizens with the birds, exposed to no danger but from the larger of the serpent tribe, or the more insatiable rapacity of man.

The mangabey was so called by Buffon from an erroneous idea that his specimens were obtained from the territory of that name in the Island of Madagascar: it appears, however, more probable that it is a native of the western coast of Africa. Its common English designation of 'the White eyelid' is certainly both expressive and appropriate; for although many others of the tribe—more especially among the baboons—have the same remarkable absence of colouring matter in the skin of their upper eyelids, yet in none—excepting only in the following species—has it a hue so perfectly dead-white or so strongly contrasted with the colour of the face. The latter was formerly regarded as a mere variety of the present; but the distinctions between them appear to be permanent and are quite sufficient to justify their separation. In the animal now under consideration the head, the whole of the upper surface and sides of the body, the tail, and the outsides of the limbs, are of one uniform deep grayish black, or more properly soot-colour, becoming deep black on the lower part of the legs and on the hands. On the under part of the moustaches—which are bushy, spreading, and directed backwards—the fore part of the chest, the under surface of the body, and the inside of the limbs, the general colour is of a light gray with only a slight mixture of a dusky hue. The fingers are long and slender; the ears rather small and blackish; and the whole face is livid, with a blacker tinge round the eyes, and on the nose, lips, and chin. The tail is thick and cylindrical, scarcely tapering towards the point, and generally turned backwards over the body, which it exceeds in length. This species is not destitute of intelligence, and is easily taught to perform a variety of antic tricks, to the effect of which the peculiar expression of its physiognomy greatly contributes. It is generally good-tempered, and tolerably well-behaved, although not without its fair share of petulance and caprice.

The collared white-eyelid monkey differs from the common white-eyelid monkey principally in the deep chestnut brown of the upper surface of its head, and in the collar of pure white crossing the fore part of its neck, and including the large bushy moustaches which extend forwards upon the cheeks and pass backwards beneath and behind the ears.

If elegance of form, grace of motion, gentleness of disposition, superior sagacity, and penetration, of physiognomy, presented characters to the naturalist proper for the purposes of classification, the mona, or varied monkey, would, incontestably, serve as a type for peculiar division. It is strikingly distinguished from the other guenons in general, by these qualities, and more especially from the malbrouk, the callitrix, and the grivet. Even the mangabey, though gentler than the others, is less so than the varied monkey. But this animal has no physical character, to confirm and establish the peculiar distinction to which its moral qualities would seem to entitle it. In truth the species of the varied monkey does not differ essentially from the other guenons but by its colours, and in these we discover a variety, which we do not recognise in the other species. Its head is of a brilliant golden green, its back and sides are of a beautiful maroon, variegated with black; the exterior portion of the limbs, and of the tail, a pure slate-coloured gray, and its neck, chest, belly, and the internal facing of the limbs, a shining white. On each side of its cheeks are thick whiskers of a straw-coloured yellow mixed with black points.

The striated monkey is, in size, no larger than a squirrel. The tail is long, very thickly covered with fur, and beautifully marked through its whole length with alternate rings of black and white. The body is of a reddish ash-colour, slightly undulated with dusky shades. The face is of a dark flesh-colour, having on each side a very large and thick tuft of milk-white hair, standing out before the ears. The paws, which are covered with hair, have sharp nails. In a native state, these very beautiful little creatures, like most others of their tribe, live in society, on trees, the females carrying their young ones firmly clinging to their backs. They are found in the woods and forests of South America, where they are believed to subsist chiefly on fruits and vegetables: those, however, which have been kept in a state of captivity, have been known to feed on fish, insects, and worms.

The entellus monkey is one of the most common monkeys both of the Peninsula of Hindostan and of the islands of the Indian archipelago; but it has seldom been brought alive to this country, and on the continent of Europe specimens appear to be almost equally rare. The species was first made known by N. Dufresne, in 1797, from a skin in his possession, which was shortly afterwards figured by Audebert in his large work on the monkeys, whence it was adopted by later zoologists. After an interval of more than twenty years, the arrival of a living individual, of small size and immature age, at the Jardin du Roi in Paris, enabled M. Cuvier to publish a second original figure, more valuable than the first.

The genus semnopithecus of Cuvier, of which the entellus offers a truly characteristic example, is distinguished from the other monkeys of the Old world by several remarkable characters, affecting not only its outward form but also some essential parts of its internal organization. In the degree of their intelligence, the form of their heads, and the general outline of their proportions, the species which compose it seem to occupy an intermediate station between two other purely Asiatic groups, the gibbons of Buffon, which are the hylobates of the modern systematists, and the macaques, of which the wanderow may be regarded as the type. Their bodies are slightly made; their limbs long and slender; their tails of great length, considerably exceeding that of the body; their callosities of small size; and their cheek-pouches, in those species which appear to possess them, so inconsiderable as scarcely to deserve the name. The character, however, which at once distinguishes them from the cercopithecei, is found in their dentition, and more particularly in the form of the crown of the last molar tooth of the lower jaw, which, instead of four tubercles, one at each angle of the tooth as in the latter genus, offers five such projections on its surface, the additional one occupying the middle line of the tooth, and being placed posteriorly to the rest. The gibbons and the macaques are also furnished with this additional tubercle. The entellus is too distinct a species to be confounded with any other. It is of a uniform ashy-gray on the upper parts, becoming darker on the tail, which is grayish brown, of equal thickness throughout, and terminated by a few long hairs running out into a kind of point, but not forming a tuft. The under surface of the body is of a dingy yellowish white; and the fore arms, hands, and feet are of a dusky black.—*Abridged from Griffith.*

Note E.—*The Loris and Lemurs.*

The genus loris forms part of that division of the quadrumanous order which is essentially distinguished by an unequal number or irregular disposition of the incisor teeth in the two jaws; terminal nostrils with sinuous openings; and a long subulate or sickle-shaped claw upon the fore-finger of the hinder hands, all the rest of the nails being flat and rounded like those of the greater part of the monkeys and of man. The loris differ from the other genera of this family in having four incisors in the upper jaw, placed in pairs with a vacant space between, and six in the lower, directed obliquely forwards; canines of moderate size; twelve molars above and ten below; a short rounded head; and little or no tail. Sometimes, it would appear, the lateral incisors of the upper jaw, which are always smaller than the others, are either entirely wanting or so minute as not to be easily seen. In addition to these primary characters the loris is distinguished by large prominent eyes, placed in front of the head, and at no great distance from each other; short ears, scarcely rising through the hair with which they are invested; a rough tongue; nostrils projecting beyond the mouth, and surrounded by a naked muzzle; and thumbs widely separated from the fingers both on the fore and hinder hands. Linnæus confounded both the well-authenticated species of this group, under the name of lemur tardigradus.

The slow-paced lemur is an animal of small size scarcely equal to that of a cat. The largest individual yet noticed appears to be that seen by Pennant, who states its length at no less than sixteen inches from the nose to the extremity of its back. Its proportions are short and thickset; and the apparent clumsiness of its form is much increased by the manner in which it usually contracts itself into a kind of ball. The habits of this singular creature are perfectly nocturnal. It sleeps throughout the whole of the day, unless when disturbed, either rolled up on the floor of its cage, or more commonly suspended by its paws from the bars, with its body drawn together and its head folded in upon the breast. Towards evening it rouses itself by degrees, and remains watchful during the night. Its first care on awaking is to make itself clean by licking its fur like a cat; and its next is to satisfy its appetite. Its natural food appears to consist of a mixture of animal and vegetable substances. The latter—especially the sweeter fruits, and sopped bread sprinkled with sugar—have usually formed the principal part of the diet of those with whose history we have been made acquainted; but the smaller animals, whether mice, birds, or insects, appear to be more peculiarly acceptable. In its motions, it is excessively slow and languid. In consequence, as we may imagine, of this want of activity, the slow-paced lemur is peculiarly susceptible of cold, to guard it from which its thick fur, so unusual in the animals of a tropical climate, is beautifully adapted. Generally speaking it is a timid and even a gentle animal, rarely offering offence unless when provoked or hastily disturbed from its slumbers. On such occasions it will bite with considerable fierceness. But in cold weather, its anger is much more easily roused, and it evinces an excessive degree of irritability. In feeding it commonly seizes its food with both hands, and then consigns it to one, sitting upright on its haunches and generally suspended by its hinder paws to eat it. When a small live animal is placed within its reach, it relaxes its hold with its fore-paws, and seizing its victim with more rapidity than might be expected from its ordinary habits, destroys it with much dexterity, and soon deposits the carcass in its stomach, devouring the bones as well the flesh, but rejecting the feathers of birds, which it previously plucks off.

The lemurs are all natives of Madagascar and of one or two smaller islands in its neighbourhood. We know but little of their habits in a state of nature, but they are said to live in large bands upon the trees feeding principally upon fruits; and its conformation renders this account extremely probable. They are almost equally agile with the monkeys; but are much more gentle and peaceable in their dispositions. In captivity they are generally good-tempered, but do not usually exhibit much playfulness or intelligence. Fruits and roots form the principal part of their nutriment; but dressed meat or even raw fish appear to be no unwelcome additions to their vegetable diet. Notwithstanding the thickness of their coats they are extremely chilly, and are very fond of basking in the sun or crouching by the fireside. In walking or leaping they usually raise their long bushy tails above the level of their backs; but when at rest they either suffer them to hang down, or coil them around their bodies to retain the warmth. In the red lemur the general colour of the upper surface of the body is of a bright rufous brown, and that of the under parts of a deep black. The former includes the sides of the face, the ears, the back and sides, and the outer surface of the limbs; the latter, the forehead, the naked face itself, the throat, breast, and abdomen, the inside of the limbs, and the entire feet with the exception of a narrow stripe of white passing across the upper surface of the hinder ones. The tail is perfectly black throughout. A large oval patch of white occupies the back of the neck, extending from behind the ears to between the shoulders, and separating the black of the head from the red of the back. Upwards of a dozen species of lemurs have been described, but their differences have not yet been satisfactorily ascertained.—*Abridged from Griffith.*

Note F.—*Pouched Animals.*

Pouched animals were known at first only in America. All the species found on that continent agree so completely in general organization, as well as in this peculiar conformation of the genitals, that Linnæus found in them the elements of a single genus, which he called didelphis or double wombed. Afterwards from the East Indies, and still later from the regions of Australasia, animals arrived equally distinguished by the possession of the abdominal pouch; these were immediately set down as genuine didelphes, and Gmelin has bestowed on them the titles of didelphis orientalis, didelphis Brunii, &c. Even the tarsier of Daubenton he inscribed among them, under the name of didelphis macrotarsus. None, however, of these animals answer to the definition of Linne; all had less than six incisors above, and less than eight below, &c.: nevertheless, Fallas, Camper, and Zimmerman still preserved the appellation of Gmelin, and thus prolonged the abuse.

At first an opinion arose that the young of these animals were actually produced in the abdominal pouch beside the mammæ of the mother. It is nearly two centuries since Marcgrave has said, "The pouch is properly the matrix of the carigueya (didelphis opossum). I have been unable to find any other; this is a point which I have ascertained by dissection. The semen is produced there, and the young are formed." Pison confirms the same facts, having, as he observes, dissected many of the carigueyas. Valentyn makes the same assertion, in his account of the Molucca Islands: "The pouch of the philanders is a matrix in which the young are conceived. This pouch is not what is usually supposed. The mammæ are, with regard to the young, what stalks are to their fruits." The young remain attached to the mammæ, until they have attained maturity, and then separate from them as the fruit drops from the stalk. These notions are also common in Virginia, even among physicians. Beverly says, that the young opossum exists in the false belly, without ever entering the true, and are developed on the teats of the mother. The Marquess of Chastellux makes a similar remark. Hence Pennant says, "That suspended to the mammæ of the mother, they remain there at first without motion: this lasts until they have acquired some development and strength; but then they undergo a second birth."

M. Geoffroy, lamenting the vagueness and obscurity existing on the subject of pouched animals, wrote an article in 1819, with this query as title, "Are the pouched animals born attached to the teats of the mother?" His object was to call the attention of scientific men to the subject, and more especially of those who possess the means of investigation in those countries which form the habitat of the animals. His observations are highly interesting and important. On the pouch, he remarks that it is not in the adult female, a cavity of equal capaciousness at all times. M. d'Aboville observed it to increase in magnitude under the influence of the phenomena of generation, and M. Geoffroy himself has observed its relative dimensions in females of the same species. It is small previous to sexual intercourse, large to excess when the young ones are about to drop from the mammæ, and of a moderate size in the period immediately following. Thus the pouch cannot be considered merely as a *second domicile*, without spring or activity; it is a true place of incubation, extending by degrees, acquiring more and more volume, as happens to every other *domicile* of the fœtus. Well, therefore, might it be called a second uterus, and the most important of the two. As to the mode in which the young are placed in the external pouch, or rather attached to the nipple, nothing is accurately known.

Pouched animals derive their appellation of *marsupiata*, or, as some call them, *marsupiales*, from the character of the pouch. It may, however, be well questioned, whether as a generic or classic term, it be unobjectionable. There are many species in which this character of the pouch does not exist, while, on the contrary, there are none without the double matrix, which would render the Linnæan appellation of didelphis more universally suitable to all the species. Be that as it may, the marsupiata are unquestionably the most singular of all known quadrupeds. With the exception of the peculiarities of their generation, there is scarcely any character in common among them. The organs of locomotion and digestion vary considerably, and that in a manner so nicely graduated, that all the shades between the carnassiers, properly so called, and the genuine rodentia, are discoverable among the animals in question by the character of the teeth. Their extremities are equally modified from those which are designed to dig the earth, to those adapted for climbing with the utmost facility the loftiest trees.

The feet among some, as the phascolomys, are calculated for digging in the ground. In this case, there are five toes armed with powerful nails on the fore-feet, and four only on the hinder, with a small tubercle instead of thumb. With others (as the kangaroos, potoroos, and Perameles) the hinder feet are conformed for the execution of rapid leaps; and then they have but four toes, the second of which is very strong, longer than the others, and furnished with a nail almost as thick as a hoof. The two internal ones are small and connected. The metatarsus is very long, as well as the limb to which it belongs. The fore-paws are very short, and terminated by five toes furnished with tolerably long talons. In the phalangers, which are eminent climbers, the posterior thumb is considerably separated, and without a claw; the two toes which immediately follow it, are connected by the skin as far as the last phalanx. The toes of the fore-feet differ little from those of the common carnassiers, while in the koala these same toes are divided into two groups for the act of seizing; the thumb and index being on one side, and the three others on the opposite. The four hinder toes are connected two by two, and very distinct from the thumb. In the dasyuri, which run upon the ground like the martens, the fore-feet have five toes, and the hinder four, all separated and armed with curved claws, while the hinder thumb is but a simple tubercle. Finally, the didelphes which climb trees have toes like the dasyuri, except that the posterior thumb is distinct, and without a nail like that of the phalangers. The chironectes which swim, differ from the didelphis, only in having the hinder feet palmate. There is no tail in the phascolomys. In the koalas it is a simple tubercle, but considerably long in all the other genera. In the didelphis, the chironectes, and the true phalangers, it is naked, scaly, and prehensile. In the kangaroos and potoroos, it is strong, triangular, and conic, and concurs to locomotion with the long hinder limbs. The isoodonta and the peramelas have it of the same form, but much less robust. Finally, the dasyuri, and particularly the flying phalangers, have it much elongated, and more or less tufted. In the petauristæ alone, we find the skin of the sides extended between the fore and hind legs, serving as a parachute after the manner of the galeopitheci and polatouches. The crab-eating didelphis, the kangaroo, the perameles, the isoodon, the potoroo, the phalangers, the petauristæ, and the phascolomys alone, have the ventral pouch which has given a denomination to the entire tribe. In the rest the mammæ are visible without, and some have on each side the fold of skin which forms the pouch, but scarcely visible The number of the mammæ vary, and is especially considerable among the didelphes.

The physiognomy of these animals is in relation to their natural habits and mode of living. The didelphes and dasyuri have a conic head, elevated ears, mouth deeply cut, and the aspect of carnivora. The perameles rather resemble rats, the long-legged kangaroos, hares, and the phascolomys the marmot. Some, such as the didelphis and dasyuri, are carnassiers, living on eggs, small birds, and corrupted flesh, and sometimes crustacea and insects. Others, as the kangaroo and phascolomys, are sustained purely on vegetables. The phalangers are probably both frugivorous and insectivorous. A very remarkable fact is, that the marsupiata have, as yet, been observed only in South America, New Holland, and some islands of the Indian archipelago. The didelphes, properly so called, or the sarigues, and the chironectes, are proper to the first of these countries. All the others, except the phalangers, with naked and scaly tails, are peculiar to the second; and those last-mentioned phalangers, and a species of the kangaroo, are alone to be met with in the Indian archipelago.

The Virginian opossum is an animal by no means eminent for intelligence. It digs a burrow or den, near thickets not too far removed from the habitations of men, and sleeps there the live-long day. Seeing but badly while the sun is above the horizon, it is in the night that it proceeds in search of food, and of the female during the season of its amours. It mounts trees, penetrates into farm-yards, attacks the small birds and poultry, sucks their blood, devours their eggs, and then returns to conceal itself at the bottom of its retreat. It frequently contents itself with reptiles and insects, and fruits occasionally form a portion of its food. Though its mode of life is very analogous to that of the foxes and weasels, it is considerably less sanguinary and cruel.

The Mexican opposum is about eight inches long, and the tail is about a foot. The muzzle is inclining to be thick, and the ears are rather large. The eyes are slightly bordered with blackish. It is marked in the frontal ridge with a longitudinal line of brown, grayish on the edges.

The short-tailed opossum is something more than five inches, and the tail a little more than an inch. Its ears are of moderate size, naked, and of a rounded form. The tail is very short in comparison of the other species of this genus.

Note G.—*The Phalangers.*

It was in consequence of this union that these mammalia received the name of phalangers, from Buffon and Daubenton. It was a remarkable character at the epoch in which those writers flourished, and they named from it the only species then known to exhibit it. Since that period, however, it has been found in many other genera. These animals live almost continually in trees, where they subsist on fruits and insects. They are slow in their movements, and emit an unpleasant odour, which proceeds from a liquor secreted in a gland, observable near the anus. The phalangers are found in the Moluccas, New Holland, and Van Diemen's Land.

The Vulpine Phalanger is about the size of a large cat. The general proportions of its body are elegant and delicate, more so than those of the other phalangers. The upper part and sides of the body, as well as the basis of the tail, are grayish-brown, approaching to fawn-colour on the shoulders. The head is of a grayish-fawn, deeper than that of the belly. The ears are naked within, and covered with gray and fawn-coloured hairs without. The external side of the limbs is rather of a more obscure colour than the back. The tail is covered with hair in its entire extent, with the exception of a narrow band placed underneath, which commences about the middle, and continues to the point. The skin which covers this band is slightly granulated. The hairs of the tail are long, and of a very fine black, except at the base, where they are of the same colour as the back.

The phalanger of Cook is about one foot two or three inches long. The tail is nearly equal in length to the whole body. The upper part of the body of a reddish-gray. The under part white under the chin and on the upper lip.

The second tribe of the phalangers of which some naturalists make a genus, is the Petauristæ, or Flying Phalangers. The most peculiar character of the petauristæ is an extension of the skin of the sides, whereby the anterior and the posterior extremities are united, and a kind of parachute rather than a wing is formed. There is a spacious ventral pouch in the females. The tail is very long, not prehensile; furnished with hair, sometimes round, sometimes flat. The habits of these animals are pretty similar to those of the phalangers we have last noticed.

BOOK IX.

OF THE ELEPHANT, RHINOCEROS, ETC.

CHAP. I.

OF THE ELEPHANT.

Having gone through the description of those quadrupeds that, by resembling each other in some striking particular, admit of being grouped together, and considered under one point of view, we now come to those insulated sorts that bear no similitude with the rest, and that to be distinctly described must be separately considered.[1]

The foremost of these, and in every respect the noblest quadruped in nature, is the elephant, not less remarkable for its size than its docility and understanding. All historians concur in giving it the character of the most sagacious animal next to man; and yet, were we to take our idea of its capacity from its outward appearance, we should be led to conceive very meanly of its abilities. The elephant, at first view, presents the spectator with an enormous mass of flesh that seems scarcely animated. Its huge body covered with a callous hide, without hair; its large misshapen legs, that seem scarcely formed for motion; its little eyes, large ears, and long trunk; all give it an air of extreme stupidity. But our prejudices will soon subside when we come to examine its history; they will even serve to increase our surprise, when we consider the various advantages it derives from so clumsy a formation.

The elephant is seen from seven to no less than fifteen feet high.[2] Whatever care we take to imagine a large animal beforehand, yet the first sight of this huge creature never fails to strike us with astonishment, and in some measure to exceed our idea. Having been used to smaller animals, we have scarcely any conception of its magnitude; for a moving column of flesh, fourteen feet high, is an object so utterly different from those we are constantly presented with, that to be conceived it must be actually seen. Such, I own, were the suggestions that naturally arose to me when I first saw this animal, and yet for the sight of which I had taken care to prepare my imagination. I found my ideas fall as short of its real size as they did of its real figure; neither the pictures I had seen, nor the descriptions I had read, giving me adequate conceptions of either.

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[1] See Note, p. 474.—Ed.

[2] Elephants very rarely exceed ten feet in height. Seven feet and upwards is the East India Company's standard for serviceable elephants, measured at the shoulder, as horses are. A large elephant weighs from 6,000 to 7,000 pounds.—Ed.

It would, therefore, be impossible to give an idea of this animal's figure by a description; which, even assisted by the art of the engraver, will but confusedly represent the original. In general, it may be observed, that the forehead is very high and rising, the ears very large and dependent, the eyes extremely small, the proboscis or trunk long, the body round and full, the back rising in an arch, and the whole animal short in proportion to its height. The feet are round at the bottom; on each foot there are five flat horny risings, which seem to be the extremities of the toes, but do not appear outwardly. The hide is without hair, full of scratches and scars, which it receives in its passage through thick woods and thorny places. At the end of the tail there is a tuft of hair, a foot and a half long. The female is less than the male, and the udder is between the fore-legs. But a more accurate, as well as a more entertaining description of the parts, will naturally occur in the history of their uses.[3]

Of all quadrupeds, the elephant is the strongest, as well as the largest; and yet, in a state of nature, it is neither fierce nor formidable.[4] Mild, peaceful, and brave, it never abuses its power or its strength, and only uses its force for its own protection, or that of its community. In its native deserts, the elephant is seldom seen alone, but appears to be a social, friendly creature. The oldest of the company conducts the band; that which is next in seniority brings up the rear. The young, the weak, and the sickly, fall into the centre; while the females carry their young, and keep them from falling by means of their trunks. They maintain this order only in dangerous marches, or when they desire to feed in cultivated grounds; they move with less precaution in the forests and solitudes; but without ever separating, or removing so far asunder as to be incapable of lending each other any requisite assistance. Nothing can be more formidable than a drove of elephants, as they appear at a distance in an African landscape; wherever they march, the forests seem to fall before them; in their passage, they bear down the branches upon which they feed; and if they enter into an enclosure, they destroy all the labours of the husbandman in a very short time. Their invasion is the more disagreeable, as there is no means of repelling them; since it would require a small army to attack the whole drove when united. It now and then happens that one or two is found lingering behind the rest, and it is against these that the art and force of the hunters are united; but an attempt to molest the whole body would certainly be fatal. They go forward directly against him who offers the insult, strike him with their tusks, seize him with their trunks, fling him into the air, and then trample him to pieces under their feet. But they are thus dreadful only when offended, and do no manner of personal injury when suffered to feed without interruption. It is even said that they are mindful of injuries received; and when once molested by man seek all occasions for the future to be revenged; they smell him with their long trunks at a distance; follow him with all their speed upon the scent; and though slow to appearance, they are soon able to come up with and destroy him.

In their natural state they delight to live along the sides of rivers, to keep in the deepest vales, to refresh themselves in the most shady forests and watery places. They cannot live far from the water; and they always disturb it before they drink. They often fill their trunk with it, either to cool that organ or to divert themselves by spurting it out like a fountain. They are equally distressed by the extremes of heat and cold; and to avoid the former, they frequently take shelter in the most obscure recesses of the forest, or often plunge into the water, and even swim from the continent into islands some leagues distant from the shore.

Their chief food is of the vegetable kind, for they loathe all kind of animal diet. When one among their number happens to light upon a spot of good pasture, he calls the rest, and invites them to share in the entertainment; but it must be very copious pasture indeed that can supply the necessities of the whole band. As with their broad and heavy feet they sink deep wherever they go, they destroy much more than they devour; so that they are frequently obliged to change their quarters, and to migrate from one country to another. The Indians and negroes, who are often incommoded by such visitants, do all they can to keep them away, making loud noises, and large fires round their cultivated grounds: but these precautions do not always succeed; the elephants often break through their fences, destroy their whole harvest, and overturn their little habitations. When they have satisfied themselves, and trod down or devoured whatever lay in their way, they then retreat into the woods in the same orderly manner in which they made their irruption.

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[3] There are two species of elephant,—the Asiatic and African. The Asiatic elephant is distinguished from its African congener, principally by the character of the teeth; the head moreover is oblong, the forehead concave, and the ears do not descend lower than the neck. This species is found in the whole of Southern India, and in the neighbouring islands. The African elephant is distinguished by a round or cylindrical head, with the face more protruded than in the Asiatic species, a convex forehead, and enormous ears which descend as far as the legs. The peculiarity of the cheek-teeth also separates it; and there is reason to think that three toes only of the hind-feet have nails. The tusks are said to be of equal size both in the male and female of this species, and the eyes are situate lower, nearer the mouth, and more forward in the African elephant than in its Asiatic congener.—Ed.

[4] I have extracted the greatest part of this description from Mr. Buffon. Where I add, I mark with commas, "thus."

Such are the habits of this animal, considered in a social light; and if we regard it as an individual, we shall find its powers still more extraordinary. With a very awkward appearance, it possesses all the senses in great perfection, and is capable of applying them to more useful purposes than any other quadruped. The elephant, as we observed, has very small eyes, when compared to the enormous bulk of its body. But though their minuteness may at first sight appear deformed, yet, when we come to examine them, they are seen to exhibit a variety of expression, and to discover the various sensations with which it is moved. It turns them with attention and friendship to its master; it seems to reflect and deliberate; and as its passions slowly succeed each other, their various workings are distinctly seen.

The elephant is not less remarkable for the excellence of its hearing. Its ears are extremely large, and greater in proportion than even those of an ass. They are usually dependent; but it can readily raise and move them. They serve also to wipe its eyes, and to protect them against the dust and flies that might otherwise incommode them. It appears delighted with music, and very readily learns to beat time, to move in measure, and even to join its voice to the sound of the drum and the trumpet.

This animal's sense of smelling is not only exquisite, but it is in a great measure pleased with the same odours that delight mankind. The elephant gathers flowers with great pleasure and attention; it picks them up one by one, unites them into a nosegay, and seems charmed with the perfume. The orange-flower seems to be particularly grateful, both to its sense of taste and smelling; it strips the tree of all its verdure, and eats every part of it, even to the branches themselves. It seeks in the meadows the most odoriferous plants to feed upon; and in the woods it prefers the cocoa, the banana, the palm, and the sago tree, to all others. As the shoots of these are tender, and filled with pith, it eats not only the leaves and the fruits, but even the branches, the trunk, and the whole plant to the very roots.

But it is in the sense of touching that this animal excels all others of the brute creation, and perhaps even man himself. The organ of this sense lies wholly in the trunk, which is an instrument peculiar to this animal, and that serves it for all the purposes of a hand. The trunk is, properly speaking, only the snout lengthened out to a great extent, hollow like a pipe, and ending in two openings or nostrils like those of a hog. An elephant of fourteen feet high has the trunk about eight feet long, and five feet and a half in circumference at the mouth where it is thickest. It is hollow all along, but with a partition running from one end of it to the other; so that though outwardly it appears like a single pipe, it is inwardly divided into two. This fleshy tube is composed of nerves and muscles, covered with a proper skin of a blackish colour, like that of the rest of the body. It is capable of being moved in every direction, of being lengthened and shortened, of being bent and straightened; so pliant as to embrace any body it is applied to, and yet so strong that nothing can be torn from the gripe. To aid the force of this grasp, there are several little eminences, like a caterpillar's feet, on the underside of this instrument, which without doubt contribute to the sensibility of the touch, as well as to the firmness of the hold. Through this trunk the animal breathes, drinks, and smells, as through a tube; and at the very point of it, just above the nostrils, there is an extension of the skin, about five inches long, in the form of a finger, and which in fact answers all the purposes of one; for with the rest of the extremity of the trunk, it is capable of assuming different forms at will, and consequently of being adapted to the minutest objects. By means of this, the elephant can take a pin from the ground, untie the knots of a rope, unlock a door, and even write with a pen. "I have myself seen," says Ælian, "an elephant writing Latin characters on a board, in a very orderly manner, his keeper only showing him the figure of each letter. While thus employed, the eyes might be observed studiously cast down upon the writing, and exhibiting an appearance of great skill and erudition." It sometimes happens that the object is too large for the trunk to grasp; in such a case the elephant makes use of another expedient, as admirable as any of the former. It applies the extremity of the trunk to the surface of the object, and, sucking up its breath, lifts and sustains such a weight as the air in that case is capable of keeping suspended. In this manner this instrument is useful in most of the purposes of life; it is an organ of smelling,[5] of touching, and of suction; it not only provides for the animal's necessities and comforts, but it also serves for its ornament and defence.

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[5] Cuvier considers that the trunk is not in itself an organ of smell, but that the sense of smell is confined to that part of the nostrils which is enclosed in the bones of the head. As an organ of touch, the proboscis of the elephant is exquisitely fine. Elephants sometimes become blind; and under that privation, the poor animal can not only collect its food, and discriminate as to its quality, by this wonderful instrument, but can travel, without much difficulty, over unequal ground, avoiding lumps and hollows, and stepping over ditches. The creature, under such circumstances, rarely touches the ground with its trunk; but projecting it forward, as far as possible, lets the finger, which is curled inward to protect the nostrils, skim along the surface, to the inequalities of which this organ adjusts itself with wonderful exactness. The great care of the elephant, whether he be in a state of nature, or under the control of man, is, invariably to put his trunk out of harm, as far as he can, when any danger presents itself. If he is attacked by a tiger, or any other wild animal, he carries his trunk as high as he can in the air, and if this delicate organ be in the slighest degree in

But though the elephant be thus admirably supplied by its trunk, yet with respect to the rest of its conformation, it is unwieldy and helpless. The neck is so short that it can scarcely turn the head, and must wheel round in order to discover an enemy from behind. The hunters that attack it upon that quarter generally thus escape the effect of its indignation; and find time to renew their assaults while the elephant is turning to face them. The legs are, indeed, not so inflexible as the neck, yet they are very stiff, and bend not without difficulty. Those before seem to be longer than the hinder; but upon being measured, are found to be something shorter. The joints, by which they bend, are nearly in the middle, like the knee of a man; and the great bulk which they are to support, makes their flexure ungainly. While the elephant is young, it bends the legs to lie down or to rise; but when it grows old, or sickly, this is not performed without human assistance, and it becomes, consequently, so inconvenient, that the animal chooses to sleep standing. The feet upon which these massy columns are supported, form a base scarcely broader than the legs they sustain. They are divided into five toes, which are covered beneath the skin, and none of which appear to the eye; a kind of protuberance like claws are only observed, which vary in number from three to five. The apparent claws vary; the internal toes are constantly the same. The sole of the foot is furnished with a skin as thick and hard as horn, and which completely covers the whole under-part of the foot.

To the rest of the elephant's encumbrances may be added its enormous tusks, which are unserviceable for chewing, and are only weapons of defence. These, as the animal grows old, become so heavy, that it is sometimes obliged to make holes in the walls of its stall to rest them in, and ease itself of the fatigue of their support. It is well-known to what an amazing size these tusks grow; they are two in number, proceeding from the upper jaw, and are sometimes found above six feet long. Some have supposed them to be rather the horns than the teeth of this animal: but besides their greater similitude to bone than to horn, they have been indisputably found to grow from the upper jaw, and not from the frontal bones, as some have thought proper to assert.[6] Some also have asserted, that these tusks are shed in the same manner as the stag sheds its horns; but it is very probable, from their solid consistence, and from their accidental defects, which often appears to be the effect of a slow decay, that they are as fixed as the teeth of other animals are generally found to be. Certain it is, that the elephant never sheds them in a domestic state, but keeps them till they become inconvenient and cumbersome to the last degree. An account of the uses to which these teeth are applied, and the manner of choosing the best ivory, belongs rather to a history of the arts than of nature.

This animal is equally singular in other parts of its conformation; the lips and the tongue in other creatures serve to suck up and direct their drink or their food; but in the elephant they are totally inconvenient for such purposes; and it not only gathers its food with its trunk, but supplies itself with water by the same means. When it eats hay, as I have seen it frequently, it takes up a small wisp of it with the trunk, turns and shapes it with that instrument for some time, and then directs it into the mouth, where it is chewed by the great grinding teeth, that are large in proportion to the bulk of the animal. This pacquet, when chewed, is swallowed, and never ruminated again, as in cows or sheep, the stomach and intestines of this creature more resembling those of a horse. Its manner of drinking is equally extraordinary. For this purpose the elephant dips the end of its trunk into the water, and sucks up just as much as fills that great fleshy tube completely. It then lifts up its head with the trunk full, and turning the point into its mouth, as if it intended to swallow trunk and all, it drives the point below the opening of the windpipe. The trunk being in this position, and still full of water, the elephant then blows strongly into it at the other end, which forces the water it contains into the throat; down which it is heard to pour with a loud gurgling noise, which continues till the whole is blown down. From this manner of drinking some have

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jured, the elephant becomes wild with rage and terror. He is even afraid of a dead tiger, and carefully puts his trunk out of reach. The instinct by which the creature defends and preserves this precious instrument, is in proportion to its paramount importance. Mr. Williamson saw an elephant whose trunk had been cut through with a bill-hook; and though the wound was healed, the animal was perfectly helpless—unable to supply its own food, and incapable even of travelling without danger. He was fed with bundles of grass which were put into his mouth; had he been in a state of nature he must have perished. An affecting example of the instinct with which the elephant preserves his trunk, is exhibited in the death of the poor animal who was burned at Dublin. The author of the anatomical account says—"Doubtless the elephant's care to preserve the proboscis was great; for when we dissected him, *we found it thrust near two feet into a very hard ground;* upon which account we thought it had been burned, till the head was divided from the body, and then we found it kept fast to the ground by the proboscis." The care with which the elephant endeavours to put his trunk out of danger, makes him extremely cautious of using it as a weapon. He rarely strikes with it; though he will frequently throw clods and stones with it at objects which he dislikes. Elephants often thus attack hogs, casting their missiles with tolerable force and precision.—ED.

[6] See Mr. Daubenton's description of the skeleton of this animal.

been led into an opinion that the young elephant sucks with its trunk, and not with its mouth; this, however, is a fact which no traveller has hitherto had an opportunity of seeing, and it must be referred to some future accident to determine.[7]

The hide of the elephant is as remarkable as any other part. It is not covered over with hair, as in the generality of quadrupeds, but is nearly bare. Here and there indeed a few bristles are seen growing in the scars and wrinkles of the body, and very thinly scattered over the rest of the skin; but in general the hide is dry, rough, and wrinkled, and resembling more the bark of an old tree than the skin of an animal. This grows thicker every year; and by a constant addition of substance, it at length contracts that disorder well known by the name of elephantiasis, or Arabian leprosy; a disease to which man, as well as the elephant, is often subject. In order to prevent this, the Indians rub the elephant with oil, and frequently bathe it, to preserve its pliancy. To the inconveniencies of this disorder is added another, arising from the great sensibility of those parts that are not callous. Upon these the flies settle in great abundance, and torment this animal unceasingly; to remedy which, the elephant tries all his arts; uses not only his tail and trunk in the natural manner to keep them off, but even takes the branch of a tree, or a bundle of hay to strike them off with. When this fails, it often gathers up the dust with its trunk, and thus covers all the sensible places. In this manner it has been seen to dust itself several times a-day, and particularly upon leaving the bath. Water is as necessary to this animal as food itself. When in a state of nature, the elephant rarely quits the banks of the river, and often stands in water up to the belly. In a state of servitude, the Indians take equal care to provide a proper supply: they wash it with great address; they give it all the conveniencies for lending assistance to itself; they smooth the skin with a pumice-stone, and then rub it over with oils, essences, and odours.

It is not to be wondered at, that an animal furnished with so many various advantages, both of strength, sagacity, and obedience, should be taken into the service of man. We accordingly find that the elephant, from time immemorial, has been employed either for the purposes of labour, of war, or of ostentation; to increase the grandeur of eastern princes, or to extend their dominions. We have hitherto been describing this animal in its natural state; we now come to consider it in a different view, as taken from the forest, and reduced to human obedience. We are now to behold this brave harmless creature as learning a lesson from mankind, and instructed by him in all the arts of war, massacre, and devastation. We are now to behold this half-reasoning animal led into the field of battle, and wondering at those tumults and that madness which he is compelled to increase. The elephant is a native of Africa and Asia, being found neither in Europe nor America. In Africa he still retains his natural liberty. The savage inhabitants of that part of the world, instead of attempting to subdue this powerful creature to their necessities, are happy in being able to protect themselves from his fury. Formerly, indeed, during the splendour of the Carthaginian empire, elephants were used in their wars; but this was only a transitory gleam of human power in that part of the globe; the natives of Africa have long since degenerated, and the elephant is only known among them from his devastations. However, there are no elephants in the northern parts of Africa at present, there being none found on this side of Mount Atlas. It is beyond the river Senegal that they are to be met with in great numbers, and so down to the Cape of Good Hope, as well as in the heart of the country. In this extensive region they appear to be more numerous than in any other part of the world. They are there less fearful of man: less retired into the heart of the forests, they seem to be sensible of his impotence and ignorance; and often come down to ravage his little labours. They treat him with the same haughty disdain which they show to other animals, and consider him as a mischievous little being, that fears to oppose them openly.

But although these animals are most plentiful in Africa, it is only in Asia that the greatest elephants are found, and rendered subservient to human command. In Africa, the largest do not exceed ten feet high; in Asia, they are found from ten to fifteen. Their price increases in proportion to their size; and when they exceed a certain bulk, like jewels, their value then rises as the fancy is pleased to estimate.

The largest are entirely kept for the service of princes; and are maintained with the utmost magnificence, and at the greatest expense. The usual colour of the elephant is a dusky black, but some are said to be white; and the price of one of these is inestimable. Such a one is peculiarly appropriated for the monarch's own riding; he is kept in a palace, attended by the nobles, and almost adored by the people.[8] Some have said that these white elephants are larger than the rest;[9] others assert that they are less; and still others entirely doubt their existence.

As the art of war is but very little improved in Asia, there are few princes of the East who do not procure and maintain as many elephants as they are able, and place great confidence on their assistance in an engagement. For this purpose they are obliged to take them wild in their native forests, and tame them; for the elephant never breeds in a state of servitude. It is one of the most striking peculiarities in this extraordinary creature, that his generative powers totally fail when he comes under the dominion of man; as if he seemed unwilling to propagate a race of slaves to increase the pride of his conqueror. There is, perhaps, no other quadruped that will not breed in its own native climate, if indulged with a moderate share of freedom; and we know that many of them will copulate in every climate. The elephant alone has never been seen to breed; and though he has been reduced under the obedience of man for ages, the duration of pregnancy in the female[10] still remains a secret. Aristotle, indeed, asserts, that she goes two years with young; that she continues to suckle her young for three years, and that she brings forth but one at a time: but he does not inform us of the manner in which it was possible for him to have his information. From authorities equally doubtful, we learn, that the little one is about as large as a wild boar the instant it is brought forth; that its tusks do not yet appear; but that all the rest of its teeth are apparent; that at the age of six months, it is as large as an ox, and its tusks pretty well grown; and that it continues in this manner, for near thirty years, advancing to maturity. All this is doubtful; but it is certain that, in order to recruit the numbers which are consumed in war, the princes of the East are every year obliged to send into the forests, and to use various methods to procure a fresh supply. Of all these numerous bands, there is not one that has not been originally wild; nor one that has not been forced into a state of subjection. Men themselves are often content to propagate a race of slaves, that pass down in this wretched state through successive generations: but the elephant, under subjection, is unalterably barren; perhaps from some physical causes, which are as yet unknown.[11]

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[7] The young elephant, it is now known, does not suck by the trunk, but by the mouth only as in all other quadrupeds; during which the trunk of the young is thrown back over the head.—Ed.

[8] P. Vincent Marie.

[9] P. Tachard.

The Indian princes having vainly endeavoured to multiply the breed of elephants, like that of other animals, have been at last content to separate the males from the females, to prevent those accesses of desire, which debilitated without multiplying the species. In order to take them wild in the woods, a spot of ground is fixed upon which is surrounded with a strong pallisade. This is made of the thickest and the strongest trees; and strengthened by cross bars, which give firmness to the whole. The posts are fixed at such distances from each other that a man can easily pass between them; there being only one great passage left open, through which an elephant can easily come; and which is so contrived as to shut behind as soon as the beast is entered. To draw him into this enclosure, it is necessary first to find him out in the woods; and a female elephant is conducted alone into the heart of the forest where she is obliged by its keeper to cry out for the male. The male very readily answers the cry, and hastens to join her; which the keeper perceiving, obliges her to retreat, still repeating the same cry, until she leads the animal into the enclosure already described, which shuts the moment he is entered. Still, however, the female proceeds calling and inviting, while the male proceeds forward in the enclosure, which grows narrower all the way, and until the poor animal finds himself completely shut up, without the power of either advancing or retreating; the female in the meantime being led out by a private way, which she has been previously accustomed to. The wild elephant, upon seeing himself entrapped in this manner, instantly attempts to use violence; and, upon seeing the hunters, all his former desires only turn to fury. In the meantime, the hunters, having fixed him with cords, attempt so soften his indignation, by throwing buckets of water upon him in great quantities, rubbing the body with leaves, and pouring oil down his ears. Soon after, two tame elephants are brought, a male and a female, that caress the indignant animal with their trunks; while they still continue pouring water to refresh it. At last a tame elephant is brought forward, of that number which is employed in instructing the new-comers, and an officer riding upon it, in order to show the late captive that he has nothing to fear. The hunters then open the enclosure; and while this creature leads the captive along, two more are joined on either side of it, and these compel it to submit. It is then tied by cords to a massy pillar, provided for that purpose, and suffered to remain in that position for about a day and a night, until its indignation be wholly subsided. The next day it begins to be somewhat submissive; and in a fortnight is completely tamed like the rest. The females are taken when accompanying the males; they often come into these enclosures, and they shortly after serve as decoys to the rest. But this method of taking the elephant differs according to the abilities of the hunter: the negroes of Africa, who hunt this animal merely for its flesh, are content to take it in pit-falls; and often to pursue it in the defiles of a mountain, where it cannot easily turn, and so wound it from behind till it falls.[12]

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[10] Multis persuasam est elephantem non brutorum sed hominum more coire. Quod retro mingit non dubitatur. Sed ipse vidi marem hujusce speciei, in nostri regis stabulis, super fæmellam itidem inclusam quadrupedum more silientem, pene paululum incurvato sed sufficienter recto.

[11] On this point Goldsmith was misinformed, for Ælian asserts that elephants were bred at Rome; and Columella, a writer on rural affairs, distinctly says, "within our own walls (Rome) we have seen elephants born." In India it was thought unlucky to allow tame elephants to breed; but the Emperor Akber overcame that scruple. The custom, however, evidently went into disuse; for Tavernier, and other oriental travellers, were not only ignorant of the fact, but expressly asserted that the circumstance never took place. Upon this inaccurate information many writers on natural history founded a theory that the proud elephant refused to multiply slaves for the use of man. The experiments of Mr. Corse have, however, completely set this question at rest; and though it is probable, as long as elephants are sufficiently numerous to be taken in herds, that the greater expense of breeding them will discourage any attempts to continue the species under the direction of man, there is no doubt, if it were desirable, that the elephant might be improved in size, strength, and activity, exactly in the same manner that the horse of England has been rendered so superior in power and swiftness to the horse in a state of nature, by a judicious intermixture of various races.

The ordinary period of gestation in the elephant is twenty months and eighteen days. This point has been established by the observations of Mr. Corse. The young elephant at its birth is about thirty-five inches high. In the first year he grows about eleven inches; in the second eight; in the third six; in the fourth five; in the fifth five; in the sixth three and a half; and in the seventh two and a half. Mr. Corse thinks that elephants attain their full size between eighteen and twenty-four years of age; though other writers, reasoning from the duration of life, believe that the animal continues to increase in size, when in a state of nature, for nearly double that period. Mr. Ranking, who was resident many years in Hindostan, "saw an elephant in Bengal when it was only eighteen hours old. It was about thirty-three inches high, weak and tottering, but very playful, twisting in its proboscis a few blades of large grass."

The affection of the female elephant for her young has been denied by some writers. Mr. Williamson, however, gives an anecdote which contradicts this opinion. He says, "a female elephant will trust her young with great confidence among the human species, but is very jealous of all brutes. If, however, they suspect any trick, or perceive any danger, they become ungovernable. I recollect being one of many who were seated at the top of a flight of stone steps at the entrance into the Great House at Secrole, and had enticed the calf of a very fine, good-tempered elephant feeding below to ascend towards us. When she had nearly got up the steps her foot slipped, and she was in danger of falling; which being perceived by the mother, she darted to save the rambler, sending forth a most terrific roar, and with such a significant eye as made us all tremble. She guided the descent of her little one with wonderful caution, none of us feeling the least disposition to offer any aid on the occasion." Captain Knox, who was detained for twenty years a captive in Ceylon, says, "As the Chingalays report, they bear the greatest love to their young of all irrational creatures; for the shes are alike tender of any one's young ones as of their own. Where there are many she-elephants together, the young ones go and suck of any, as well as of their mothers: and if a young one be in distress, and should cry out, they will all in general run to the help and aid thereof; and if they be going over a river, as here be some somewhat broad, and the streams run very swift, they will all with their trunks assist and help to convey the young ones over."

During rutting time, which occurs in the spring, the elephants often become extremely violent; and it is believed, that at that period the larger males are driven from the herd. It is necessary that those which are domesticated should be kept low at that season; but this does not always prove efficacious, and the animal is either turned out into the woods or destroyed to prevent mischief. Three examples of this kind have occurred within a few years in Europe.—Ed.

The elephant, when once tamed, becomes the most gentle and obedient of all animals. It soon conceives an attachment for the person that attends it, caresses him, obeys him, and seems to anticipate his desires. In a short time it begins to comprehend several of the signs made to it, and even the different sounds of the voice; it perfectly distinguishes the tone of command from that of anger or approbation, and acts accordingly. It is seldom deceived in its master's voice; it receives his orders with attention, and executes them with prudence, eagerly, yet without precipitation. All its motions are regulated, and its actions seem to partake of its magnitude; being grave, majestic, and secure. It is quickly taught to kneel down, to receive its rider; it caresses those it knows with its trunk; with this salutes such as it is ordered to distinguish, and with this, as with a hand, helps to take up a part of its load. It suffers itself to be arrayed in harness, and seems to take a pleasure in the finery of its trappings. It draws either chariots, cannon, or shipping, with surprising strength and perseverance; and this with a seeming satisfaction, provided that it be not beaten without a cause, and that its master appears pleased with its exertions.

The elephant's conductor is usually mounted upon its neck, and makes use of a rod of iron to guide it, which is sometimes pointed, and at others bent into a hook. With this the animal is spurred forward when dull or disobedient; but, in general, a word is sufficient to put the gentle creature into motion, especially when it is acquainted with its conductor. This acquaintance is often perfectly necessary; for the elephant frequently takes such an affection to its keeper, that it will obey no other; and it has been known to die for grief, when, in some sudden fit of madness, it has killed its conductor. We are told, that one of these, that was used by the French forces in India for drawing their cannon, was promised, by the conductor, a reward, for having performed some painful service; but being disappointed of its expectations, it slew him in a fury. The conductor's wife, who was a spectator of this shocking scene, could not restrain her madness and despair; but running with her two children in her arms, threw them at the elephant's feet, crying out, that, since it had killed her husband, it might kill her and her children also. The elephant, seeing the children at its feet, instantly stopped, and moderating its fury, took up the eldest with its trunk, and placing him upon its neck, adopted him for its conductor, and obeyed him ever after with great punctuality.

But it is not for drawing burdens alone, that the elephants are serviceable in war; they are often brought into the ranks, and compelled to fight in the most dangerous parts of the field of battle. There was a time, indeed, in India when they were much more used in war than at present. A century or two ago, a great part of the dependence of the general was upon the number and the expertness of his elephants; but of late, since war has been contented to adopt fatal instead of formidable arts, the elephant is little used, except for drawing cannon, or transporting provisions. The princes of the country are pleased to keep a few for ornament, or for the purposes of removing their seraglios; but they are seldom led into a field of battle, where they are unable to withstand the discharge of fire-arms, and have often been found to turn upon their employers. Still, however, they are used in war, in the more remote parts of the East; in Siam, in Cochin-China, in Tonquin, and Pegu. In all these places they not only serve to swell the pomp of state, being adorned with all the barbarian splendour that those countries can bestow, but they are actually led into the field of battle, armed before with coats of mail, and loaded on the back each with a square tower, containing from five combatants to seven. Upon its neck sits the conductor, who goads the animal into the thickest ranks, and encourages it to increase the devastation: wherever it goes, nothing can withstand its fury; it levels the ranks with its immense bulk, flings such as oppose it into the air, or crushes them to death under its feet. In the meantime those who are placed upon its back, combat as from an eminence, and fling down their weapons with double force, their weight being added to their velocity. Nothing, therefore, can be more dreadful, or more irresistible, than such a moving machine, to men unacquainted with the modern arts of war; the elephant thus armed and conducted, raging in the midst of the field of battle, inspires more terror than even those machines that destroy at a distance, and are often the most fatal when most unseen. But this method of combating is rather formidable than effectual: polished nations have ever been victorious over those semibarbarous troops that have called in the elephant to their assistance, or attempted to gain a victory by merely astonishing their opposers. The Romans quickly learned the art of opening their ranks to admit the elephant, and thus separating it from assistance, quickly compelled its conductors to calm the animal's fury, and to submit. It sometimes also happened that the elephant became impatient of control; and, instead of obeying its conductor, turned upon those forces it was employed to assist. In either case, there was a great deal of preparation to very little effect, for a single elephant is known to consume as much as forty men in a day.

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[12] See Supplementary Note A, p. 506.

[13] See Supplementary Note B, p. 507.

At present, therefore, they are chiefly employed in carrying, or drawing burdens, throughout the whole Peninsula of India; and no animal can be more fitted by nature for this employment. The strength of an elephant is equal to its bulk, for it can, with great ease, draw a load that six horses could not move; it can readily carry upon its back three or four thousand weight; upon its tusks alone it can support near a thousand: its force may also be estimated from the velocity of its motion, compared to the mass of its body. It can go, in its ordinary pace, as fast as a horse at any easy trot; and, when pushed, it can move as swiftly as a horse at full gallop. It can travel with ease fifty or sixty miles a-day; and, when hard pressed, almost double that distance. It may be heard trotting on at a great distance; it is easy also to follow it by the track, which is deeply impressed on the ground, and from fifteen to eighteen inches in diameter.

In India they are also put to other very disagreeable offices; for in some courts of the more barbarous princes they are used as executioners: and this horrid task they perform with great dexterity: with their trunks they are seen to break every limb of the criminal at the word of command; they sometimes trample him to death, and sometimes impale him on their enormous tusks, as directed. In this the elephant is rather the servant of a cruel master than a voluntary tyrant, since no other animal of the forest is so naturally benevolent and gentle; equally mindful of benefits as sensible of neglect, he contracts a friendship for his keeper, and obeys him even beyond his capacity.[14]

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[14] The elephant, although the mildest and most inoffensive of quadrupeds, is often made a sufferer from the propensity of man to cruel sports. In India, elephants are to this day baited; and the native chiefs and nobles attach great importance to these displays. When Bishop Heber was at the court of Baroda, "The Raja," he says, "was anxious to know whether I had observed his rhinoceros and his hunting tigers, and offered to show me a day's sport with the last, or to bait an elephant for me; a cruel amusement which is here not uncommon.—I do not think he understood my motive for declining to be present. A Mussulman, however, who sat near him, seemed pleased by my refusal, said it was 'very good,' and asked me if any of the English clergy attended such sports. I said it was a maxim with most of us to do no harm to any creature needlessly: which was, he said, the doctrine of their learned men also." At the palace of Jyepoor, says the same humane person, "we were shown five or six elephants in training for a fight. Each was separately kept in a small paved court, with a little litter, but very dirty. They were all what is called 'must,' that is, fed on stimulating substances to make them furious; and all showed in their eyes, their gaping mouths, and the constant motion of their trunks, signs of fever and restlessness. Their mohouts seemed to approach them with great caution; and on hearing a step they turned round as far as their chains would allow, and lashed fiercely with their trunks. I was moved and disgusted at the sight of so noble creatures thus maddened and diseased by the absurd cruelty of man, in order that they might, for his diversion, inflict fresh pain and injuries on each other." —ED.

In India, where they were at one time employed in launching ships, a particular elephant was directed to force a very large vessel into the water: the work proved superior to its strength, but not to its endeavours; which, however, the keeper affected to despise. "Take away," says he, "that lazy beast, and bring another better fitted for service." The poor animal instantly upon this redoubled its efforts, fractured its skull, and died upon the spot.

In Delhi, an elephant passing along the streets put his trunk into a tailor's shop, where several people were at work. One of the persons of the shop, desirous of some amusement, pricked the animal's trunk with his needle, and seemed highly delighted with this slight punishment. The elephant, however, passed on without any immediate signs of resentment; but coming to a puddle filled with dirty water, he filled his trunk, returned to the shop, and spurted the contents over all the finery upon which the tailors were then employed.

An elephant at Adsmeer, which often passed through the bazar or market, as he went by a certain herb-woman, always received from her a mouthful of greens. Being one day seized with a periodical fit of madness he broke his fetters, and running through the market, put the crowd to flight, and among others, this woman, who in her haste forget a little child at her stall. The elephant recollecting the spot where its benefactress was accustomed to sit, took up the infant gently in its trunk, and conveyed it to a place of safety.

At the Cape of Good Hope it is customary to hunt those animals for the sake of their teeth.[15] Three horsemen, well-mounted, and armed with lances, attack the elephant alternately, each relieving the other, as they see their companion pressed, till the beast is subdued. Three Dutchmen, brothers, who had made large fortunes by this business, determined to retire to Europe, and enjoy the fruits of their labours; but they resolved, one day before they went, to have a last chase, by way of amusement: they met with their game, and began their attack in the usual manner; but, unfortunately, one of their horses falling, happened to fling his rider; the enraged elephant instantly seized the unhappy huntsman with his trunk, flung him up to a vast height in the air, and received him upon one of the tusks as he fell: and then turning towards the other two brothers, as if it were with an aspect of revenge and insult, held out to them the impaled wretch, writhing in the agonies of death.

The teeth of the elephant are what produce the great enmity between him and mankind; but whether they are shed like the horns of the deer, or whether the animal be killed to obtain them, is not yet perfectly known. All we have as yet certain is, that the natives of Africa, from whence almost all our ivory comes, assure us that they find the greatest part of it in their forests; nor would, say they, the teeth of an elephant recompense them for their trouble and danger in killing it: notwithstanding, the elephants which are tamed by man are never known to shed their tusks; and from the hardness of their substance they seem no way analogous to deer's horns.

The teeth of the elephant are very often found in a fossil state. Some years ago, two great grinding-teeth, and part of the tusk of an elephant, were discovered at the depth of forty-two yards in a lead-mine in Flintshire.[16]

The tusks of the mammoth, so often found fossil in Siberia, and which are converted to the purposes of ivory, are generally supposed to belong to the elephant: however, the animal must have been much larger in that country than it is found at present, as those tusks are often known to weigh four hundred pounds; while those that come from Africa seldom exceed two hundred and fifty. These enormous tusks are found lodged in the sandy banks of the Siberian rivers; and the natives pretend that they belong to an animal which is four times as large as the elephant.[17]

There have lately been discovered several enormous skeletons, five or six feet beneath the surface, on the banks of the Ohio, not remote from the river Miume, in America, seven hundred miles from the sea-coast. Some of the tusks are near seven feet long; one foot nine inches in circumference at the base, and one foot near the point; the cavity at the root or base nineteen inches deep. Besides their size, there are yet other differences: the tusks of the true elephant have sometimes a very slight lateral bend; these have a larger twist, or spiral curve, towards the smaller end: but the great and specific difference consists in the shape of the grinding-teeth; which, in these newly found, are fashioned like the teeth of a carnivorous animal; not flat and ribbed transversely on their surface, like those of the modern elephant, but furnished with a double row of high and conic processes, as if intended to masticate, not to grind their food. A third difference is in the thigh-bone, which is of a great disproportionable thickness to that of the elephant; and has also some other anatomical variations. These fossil bones have been also found in Peru and the Brazils; and when cut and polished by the workers in ivory, appear in every respect similar. It is the opinion of Dr. Hunter that they must have belonged to a larger animal than the elephant; and differing from it in being carnivorous. But as yet this formidable creature has evaded our search; and if indeed such an animal exists, it is happy for man that it keeps at a distance; since what ravage might not be expected from a creature endued with more than the strength of an elephant, and all the rapacity of a tiger!

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[15] See Supplementary Note C, p. 509.

[16] Pennant's Synopsis, p. 90.

[17] See Supplementary Note D, p. 510.

Note A.—*Modes of training Elephants.*

Elephant-hunts are carried on in different modes in different parts of India, and according as it is intended to secure a single animal or the whole herd.

The *goondah*, or large male, is taken by means of four *koomkees*, or female elephants, trained for the purpose, which are brought near to the spot where he is observed to come out of the jungle to feed. If there be more than one of these males, the hunter decides which he will secure, and advances towards him, silently and cautiously, with three koomkees, which feed as they go along, to induce the male to suppose they are wild. If he be amorously inclined, as is generally the case, he will allow their approach; and two of them pass one on each side of him, with their tails towards his head, while a third goes behind and places herself across his tail. During the time he is engaged in toying with them, a fourth female comes up with the assistants and ropes. The hunters then creep under the bellies of the tame elephants, and fasten the hind legs of the wild animal together with ropes, twisting them like a figure of eight bandage. A strong cable, about sixty feet in length, is next passed around each hind leg, and another figure of eight bandage wound round above them. Having proceeded thus far, the female elephants are withdrawn, and in his endeavour to follow, the male soon finds out the fettered state in which he is, and attempts to make his escape. The hunters follow, holding the cables till they meet with a strong tree, around the trunk of which they turn the cable a few times, and thus prevent his further retreat. This of course enrages him very much, and in his attempts to get away he exhausts himself, and then the females resuming their former station about him, the cables are shortened, and being passed round his hind-legs and the trunk of the tree, his escape is completely prevented, and his fore-legs are tied in the same manner. After being kept a little while in this situation, and having taken some food, preparations are made for his safe removal: in order to effect this, a strong cable is passed round his body, and tied behind the shoulder, and the remainder of it, being continued back, is passed round his loins and fastened: with the latter a kind of kicking strap or rope is connected, and another, answering to a crupper, is continued under his tail and along the belly till it reaches the cable behind the shoulder to which it is fastened: another rope is next passed round his buttocks to prevent him from taking a full step, and lastly, two cables with nooses are passed round his neck, and fastened to the shoulder rope; the ends of the latter are then attached to girths round the bodies of two females, and, his trappings being thus completed, he is removed as soon as the ground is cleared over which he has to pass. In performing this service, the mahouts sit as usual upon the necks of the females, but are covered with a dark cloth, that they may escape the notice of the animal which they wish to capture. Sometimes in the midst of their operations the male observes them, and becoming enraged, they get off the ground by running up a rope attached around the koomkee's neck, and then make their way off as speedily as possible.

When a whole herd is to be taken, the mode employed is very different. A number of persons, to the amount of 500, divide into small parties, forming a large circle round the herd: each party lights a fire, and clears a road to the next station, which concludes the first day's work. On the following morning a new, but more circumscribed, circle is formed, except towards that point to which they wish the elephants to move, to either side of which those parties advance which were most in the rear. A great noise is then made, and the elephants, being alarmed, proceed forwards, and a new circle is formed, which from day to day is lessened, till they arrive at the *keddah*, or place in which they are to be secured, and which consists of three enclosures, of which the first is the largest, and the last the smallest. The enclosures are constructed of strong palisades, fastened on the outer side by buttresses, and each surrounded by a deep ditch: the entrances to them are narrow and dressed with trees and bamboos, to imitate a jungle. To the first enclosure, or *baigcote*, are two entrances, and the great difficulty is to induce the elephants to enter it, as the leader appears to suspect a snare, but after one has passed the whole herd follow. The gates are then barricaded, fires raised around the enclosure, and a great noise set up to drive the animals into the second, or *doobrazecote*, and afterwards into the third, or *rajecote*. During the time that the herd is confined in the enclosures, they make frequent attempts to escape, but at whatever quarter they endeavour so to do, the hunters thrust in burning grass through the palisades, and make a great noise to frighten them off. Having been driven into the last enclosure, they are kept there for some days, and fed sparingly, near the *roomee;* but care is taken that there be a pool of water within the enclosure for the herd to refresh themselves. In order to secure them, the gates leading to the roomee—a narrow passage sufficient to allow an elephant to pass into, but not turn round in it—are opened, and one of the animals is enticed into it; the gates are then shut, and after he has fatigued himself, in his exertions to escape, ropes with nooses are thrown down, and as soon as he treads in one it is drawn tight, and his leg secured to the palisade, and so on till all four are tied: after which, men enter and secure him with ropes, as has been before described, when he is brought to the end of the roomee, and fastened to two female elephants, in readiness for that purpose, which conduct him to a tree to which he is bound. Sometimes, instead of driving the herd into different enclosures, and into the roomee to be bound, there is but one large enclosure, and into this the koomkees are sent, and the elephants are tied in the same mode employed for securing the goondahs.

Such is the mode of elephant-hunting in India, but in Ceylon there is some difference. A large enclosure is made with cocoa wood around a pool of water, into which are several long and tortuous passages for the elephants, and some smaller wickets for the hunters. The ponds having been guarded for some days, to prevent the animals getting access to them, they are beset in the woods by the natives, who drive them out; when, finding themselves surrounded on every side except on that of the enclosed passages, they are compelled by thirst and the surrounding noise, which is continually kept up, to pass through these into the enclosure. Here they are separated by the hunters, and driven into smaller enclosures, where they are fettered with ropes. When the elephant has been secured to a tree, he is tended by a mahout, and three or four coolies, who supply him with food and water, and endeavour to attach him by kind treatment, driving away the flies, and scratching his head and trunk with a coarse kind of broom, made by splitting one end of a long bamboo into many pieces; frequently also squirting water over him, to refresh him. By degrees he allows his keeper to approach and pat him gently, at which time he is talked to in a soothing tone: in a short time an acquaintance is formed between them, and the mahout gets on his back from a tame elephant, and, as the animal becomes more submissive, gradually comes forward to his neck, which is the driver's usual seat. During this period he is occasionally led out for exercise by the tame elephants, and in five or six weeks obeys the orders of his keeper, after which the cords are gradually removed, and in the course of six or seven months he is sufficiently subdued to be led about from place to place by his *mahout;* care, however, being taken that he is not brought to his old haunts, lest he might endeavour to escape.

Lieutenant de Batts in his 'Rambles in Ceylon' says: "After heavy rains, the track of these herds is easily detected, by the impressions of their feet on the soft clay. Some of the natives evince considerable sagacity in immediately discovering the least vestige of the foot-print of an elephant. From the most trifling marks they can confidently state the number, and, what appears still more extraordinary, the size, of the elephants composing the herd. The secret of this last discovery consists in the anatomical fact, that twice the circumference of an elephant's foot is exactly equal to his greatest height, measuring from the fore-foot to the point that corresponds with the withers of a horse. By long practice, and perfect acquaintance with the formation of the foot of the animal, the most expert native huntsmen can, by closely examining even a small section of the impression that it leaves, calculate his height, and nearly approximate to the truth."

Note B.—*Tractableness of Elephants.*

The duke of Devonshire, having been asked by a lady of rank what she should send him from India, laughingly answered, "Oh, nothing smaller than an elephant!" his grace was surprised to find, at the expiration of some months, a very handsome female of the species consigned to his care. The elephant was kept at his grace's villa at Chiswick, under circumstances peculiarly favourable to its health and docility. The house in which she was shut up was of large dimensions, well ventilated, and arranged in every particular with a proper regard to the comfort of the animal. But she often had the range of a spacious paddock; and the exhibition of her sagacity was therefore doubly pleasing, for it was evidently not effected by rigid confinement. At the voice of her keeper she came out of her house, and immediately took up a broom, ready to perform his bidding in sweeping the paths or the grass. She would follow him round the enclosure with a pail or a watering pot, showing her readiness to take that share of labour which the elephants of the East are so willing to perform. Her reward was a carrot and some water; but previously to satisfying her thirst by an ample draught, she would exhibit her ingenuity in emptying the contents of a soda-water bottle, which was tightly corked. This she effected in a singularly adroit manner. Pressing the small bottle against the ground with her enormous foot, so as to hold it securely at an angle of about forty-five degrees, she gradually twisted out the cork with her trunk, although it was very little above the edge of the neck; then without altering the position, she turned her trunk round the bottle, so that she might reverse it, and thus empty the water into the extremity of the proboscis. This she accomplished without spilling a drop; and she delivered the empty bottle to her keeper before she attempted to discharge the contents of the trunk into her mouth. She performed another trick which required equal nicety and patience. The keeper, who was accustomed to ride on her neck like the mahouts, or elephant drivers of India, had a large cloth or housing which he spread over her, when he thus bestrode her in somewhat of oriental state. Upon alighting, which she allowed him to do by kneeling, he desired her to take off the cloth. This she effected by putting the muscles of her loins in action, so that the shrinking of her loose skin gave motion to the cloth, and it gradually wriggled on one side, till it fell by its own weight. The cloth was then, of course, in a heap; but the elephant, spreading it carefully upon the grass with her trunk, folded it up, as a napkin is folded, till it was sufficiently compact for her purpose. She then poised it with her trunk for a few seconds, and by one jerk threw it over her head to the centre of her back, where it remained as steady as if the burden had been adjusted by human hands. The affection of this poor animal for her keeper was very great. The man who had the charge of her in 1828, had attended her for five years, having succeeded another who had been with her eight or ten years. When first placed under his charge, she was intractable for some time, evidently resenting the loss of her former friend; but she gradually became obedient and attached, and would cry after him whenever he was absent for more than a few hours. The elephants of India, in the same way, cannot easily be brought to obey a stranger, and manifest a remarkable knowledge of their old mahouts if they should meet after a long separation. This elephant was about twenty-one years old when she died, in 1829. We have understood that the disease which carried her off was pulmonary consumption.

The inhabitants of this country recently witnessed the dramatic exhibition of an elephant, which afforded them a more remarkable example of the sagacity of this quadruped than the ordinary docility which it manifests at the command of the showman. This elephant was a large female from Siam, named Mademoiselle D'Jeck, and was exhibited in the Adelphi theatre, London, and various provincial theatres. In 1830 she was taken to America. She was well disciplined, and exhibited her feats with considerable effect, by their adaptation to scenic display. To march in a procession and to kneel down without any more perceptible bidding than the waving of a hand, to salute a particular individual, to place a crown upon the head of "the true prince," to eat and drink with great gravity and propriety of demeanour, and to make her reverence to an audience without any apparent signal, are very striking evidences of the tractability of the creature. The animal took part in the scene with almost undeviating precision; displayed no want of confidence or self-possession in the midst of lights, and music, and the shouts of the people; and made her parting salute with as much grace as if she had Emperors and Popes only to bow to. One of the most curious scenes in which she took a prominent part, was that in which she assisted the escape of the prince and his adherents from prison, by kneeling upon her hind legs, and thus forming an inclined plane, upon which her friends might safely reach the ground. When first brought out upon the stage M'selle D'Jeck would not be led to any particular point, till she had carefully tried the strength of the boards upon which she trod, thrusting her trunk upon every suspicious spot, and slowly and hesitatingly placing her feet in advance, before she moved her body forward. A remarkable example of this instinct is mentioned by Johnson in his 'Indian Field-sports:'—"An elephant belonging to Mr. Boddam, of the Bengal civil service at Gyah, used every day to pass over a small bridge, leading from his master's house into the town of Gyah. He one day refused to go over it, and it was with great difficulty, by goring him most cruelly with the *hawkuss* (an iron instrument), that the *mohout* (driver) could get him to venture on the bridge, the strength of which he first tried with his trunk, showing clearly that he suspected that it was not sufficiently strong. At last he went on, and before he could get over, the bridge gave way, and they were precipitated into the ditch, which killed the driver, and considerably injured the elephant."

One of the most remarkable narratives of the ancient display of elephants in a theatre, is that of Ælian, who has described, in a very lively manner, the extreme docility of the elephants of Germanicus.

At that period elephants were *bred* at Rome—a fact which has been most unaccountably overlooked in the descriptions of modern naturalists, but the practicability of which has received abundant confirmation from recent experience. Great care, according to Ælian, was paid to their health; and the nicest discipline was used to extinguish whatever was ferocious in their nature, and to call forth their sagacity by undeviating kindness. Particular attention was directed to the effect of music upon them; and they were so accustomed to musical instruments, that they not only lost all dread of the clashing of cymbals, but learnt to feel delight at the gentle notes of flutes, and would beat time with their feet when their ears were gratified with the agreeable sounds to which they were habituated. Their keeper accustomed them also to the sight of great multitudes of people. Upon an occasion when a particular exhibition of the docility of the elephants was required, twelve of the most sagacious and well-trained were selected, who, marching into the theatre with a regular step, at the voice of their keeper moved in harmonious measure, sometimes in a circle, and sometimes divided into parties, scattering flowers over the pavement. In the intervals of the dance, they would beat time to the music, still preserving their proper order. The Romans, with their accustomed luxury, feasted the elephants, after this display, with prodigal magnificence. Splendid couches were placed in the arena, ornamented with paintings, and covered with tapestry. Before the couches, upon tables of ivory and cedar, was spread the banquet of the elephants, in vessels of gold and silver. The preparations being completed, the twelve elephants marched in, six males clad in the robes of men, and six females attired as women. They lay down in order upon their couches, or "*tricliniums* of festival recumbency,"[*] and, at a signal, extended their trunks and ate with most praiseworthy moderation. Not one of them, says Ælian, appeared the least voracious, or manifested any disposition for an unequal share of the food, or an undue proportion of the delicacies. They were as moderate, also, in their drink, and received the cups which were presented to them with the greatest decorum. According to Pliny, at the spectacles given by Germanicus, it was not an uncommon thing to see elephants hurl javelins in the air, and catch them in their trunks, fight with each other as gladiators, and then execute a Pyrrhic dance. Lastly, they danced upon a rope, and their steps were so practised and certain, that four of them traversed the rope, bearing a litter which contained one of their companions who feigned to be sick.[†] This feat of dancing or walking upon a rope, might, perhaps, be doubted, if it rested merely upon the testimony of a single author; but the practice is confirmed by many ancient writers of authority, who agree with Pliny, that the elephants trained at Rome would not only walk along a rope forward, but retire backward with equal precision. Seneca describes an elephant who, at the command of his African keeper, would kneel down, and walk upon a rope. Suetonius also mentions, that an elephant in the presence of the Emperor Galba, climbed up an inclined rope to the roof of the theatre, and descended in the same way, bearing a sitter. Dion gives a similar testimony to the extraordinary power of so heavy an animal to walk along a rope without any balance—a docility which is the more wonderful, when we bear in mind that one of the strongest instincts which the elephant possesses, is that which impels him to experiment upon the stability of every surface which he is required to cross, before he will trust his body to the chance of breaking down the support which is prepared for him. The yielding rope must have called this instinct into action; although it should be observed, that the elephant will pass a bridge which vibrates, when nothing will induce him to set foot upon one whose tottering condition manifests its insecurity. It may a little abate our surprise at the rope-dancing faculty of the elephant, when we learn that a horse has exhibited the same performance. At the solemnities which attended the wedding of Robert, brother to the King of France, in 1237, a horse was ridden along a rope.

Amongst the curious feats of elephants, though less remarkable than those we have described, Arrian mentions, that he saw an elephant who, having a cymbal attached to each knee, and holding a third by his proboscis, beat a measure with astonishing exactness; and that other elephants danced in a circle round him, without deviating in the least from the time which their companion indicated. Busbequius, who was ambassador from the emperor of Germany to Constantinople, in 1555, saw an elephant there not only dance with elegance and accuracy, but play with a ball with great skill, throwing it with his trunk, and catching it again, as easily as a man could with his hands. Of the reverence which elephants may be taught to pay to human beings, we have several remarkable instances. An elephant is recorded to have saluted Domitian; and Martial has alluded to the circumstance in a nauseously flattering epigram, which intimates that the creature paid this homage without any command; and that he instinctively felt the divinity, as the poet calls it, of this pampered tyrant. The elephant which Emanuel of Portugal presented to Leo X. went upon his knees, with a profound inclination of his head, when he first saw the Pope. The veneration of the elephant for persons in authority has descended to those of secondary dignity; for Carden saw the one belonging to the queen of Bohemia, which was also very sagacious in other respects, welcome an archbishop of Milan, upon his bended knees. Such homage as this, however agreeable it may be to human pride, is as worthless as that which Augustus received upon his triumphal entry into Rome, after the battle of Actium, when the parrots from the windows cried out "Honour and victory to Cæsar." The conqueror gave enormous prices for these sagacious birds; but one bird, unluckily forgetting his last lesson, repeated that which he had been taught when the success of Augustus over his great rival was not so sure—"Honour and victory to Antony the Emperor"—and then Augustus grew tired of his winged flatterers, as he called them,—perhaps without making the discovery that all flatterers are equally contemptible.

The instinct which the elephant possesses of trying the strength of any construction, whether natural or artificial, which it is necessary for him to cross, is particularly worthy of observation. When the enormous weight of a full-grown elephant is considered, it must be obvious, that if the creature were rashly to place his body upon any frail support his danger would be extreme. His caution, therefore, in avoiding such an evil is constantly exercised; and the powerful as well as delicate instrument of touch which he possesses enables him always to be convinced of his security, without incurring any risk under ordinary circumstances. The elephant at the Adelphi retained this instinct in full force, however she might have been led away from her natural habits by the artificial restraints of her discipline;—and we, therefore, give full belief to the assertion. We are not quite so prepared to believe what we have also heard stated with regard to this animal, that upon being satisfied of the strength of the stage, and finding herself in a theatre, she immediately, without any direction from her keeper, began to rehearse the scenes which she had previously performed at Paris. Pliny, however, tells us, that an elephant, having been punished for his inaptitude in executing some feat which he was required to learn, was observed at night endeavouring to practise what he had vainly attempted in the day;—and Plutarch confirms this, by mentioning an elephant who practised his theatrical attitudes, alone, by moonlight.

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[*] Sir T. Brown.

[†] *Plinii Nat. Hist.* lib. viii. c. 2. It is difficult to understand how the elephants could carry a litter, without walking along two parallel ropes. The text of Pliny gives no elucidation of this point.

The power of foregoing a present good, and still more, the resolution of submitting to a present evil for the sake of a future advantage, is surely an effort of reason, and marks the calculation and prudence of a reflective nature; but though men themselves often fail to show it, it is not unfrequently evinced by some of the inferior animals. We are told in the 'Asiatic Researches' of an elephant that was in the habit of voluntarily going every morning to the military hospital at Calcutta, for the cure of an extensive ulcer on its back, and though it had to suffer severe pain from the powerful caustics that it was requisite to apply to the sore, yet it continued to be a very punctual patient, and readily submitted to this severe treatment till the cure was completed.

To contrive, to adapt means to certain purposes, and to vary these according to circumstances, marks the actions of an intelligent agent. It is related that Chunee, the elephant that was so long at Exeter Change, on being ordered one day to take up a sixpence with his trunk, was unable to do so from its having rolled out of his reach against the skirting board. Chunee stopped and reflected a little, and then drawing in a volume of air, blew it out again with such force against the skirting board as caused the sixpence to rebound from it, when he was enabled to reach it easily.

But it is not the intelligent principle only that is manifested in several of the acts of the elephant: they sometimes also display feelings and passions that show them to be possessed of some sort of moral endowment also. A painter being desirous of drawing an elephant in a particular attitude, employed a boy to throw him an apple occasionally, so as to make the animal assume the position he wished to draw it in; but more frequently the boy made only the show of doing so, and the animal was disappointed. Perceiving, however, the object of all this trickery, he determined to revenge himself, not on the boy, who was only an agent in the business, but on the painter himself, who employed him. Accordingly he patiently waited till the picture was nearly completed, and then, with one gush of water from his trunk, spoiled the painter's work and very nearly drowned the painter himself.

Note C.—*Of Elephants' Tusks.*

Before the settlements of the Portuguese on the coasts of Africa, in the latter part of the fifteenth century, the elephant ranged without much interruption, on the banks of the great rivers, whose courses, even at our own days, have not been completely traced. In the plains of the kingdom of Congo, where the herbage attains a wild luxuriance amidst innumerable lakes, and on the borders of the Senegal, whose waters run through extensive forests, herds of elephants had wandered for ages in security. The poor African, indeed, occasionally destroyed a few stragglers, to obtain a rare and luxurious feast of the more delicate parts of their flesh; and the desire for ornament, which prevails even in the rudest forms of savage life, rendered the chiefs of the native hordes anxious to possess the tusk of the elephant, to convert it into armlets and other fanciful embellishments of their persons. Superstition, too, occasionally prompted the destruction of this powerful animal; for the tail of the elephant had become an object of reverence, and therefore of distinction to its possessor: and the huntsman, accordingly, devoted himself to steal upon the unsuspecting elephant in his pasture, and to cut off his tail with a single stroke of his rugged hatchet. But these were irregular and partial incentives to the destruction of the most mighty, and, at the same time, the most peaceful inhabitant of the woods. The steady and inexorable demands of commerce had not yet come to the shores of Africa, to raise up enemies to him in all the tribes amongst whom he had so long lived in a state of comparative security. The trade in ivory had been suspended for more than a thousand years. There were periods, indeed, in the history of the refined nations of antiquity, when this destruction of the elephant was as great as in modern times:—when Africa yielded her tributes of elephants' teeth to the kings of Persia; when the people of Judea built "ivory palaces;" when the galleys of Tyre had "benches of ivory;" when, contributing to the barbarous luxury of the early Grecian princes,

> "The spoils of elephants the roofs inlay;"

when the Etruscan attributes of royalty were sceptres and thrones of ivory; when the ancient kings and magistrates of Rome sat in ivory seats; when colossal ivory statues of their gods, far exceeding in their vast proportions and their splendid ornaments, all the magnificence of the moderns, were raised by the Greeks of the age of Pericles; and when immense stores of ivory, to be employed with similar prodigality, were collected in the temples. In the time of Pliny, the vast consumption of ivory for articles of luxury had compelled the Romans to seek for it in another hemisphere; Africa had ceased to furnish elephants' tusks, except of the smallest kind. A century or two earlier, according to Polybius, ivory was so plentiful in Africa, that the tribes on the confines of Ethiopia employed elephants' tusks as door-posts, and for the palisades that enclosed their fields. When the Roman power fell into decay, and the commerce of Europe with Africa was nearly suspended for centuries, the elephant was again unmolested in those regions. He was no longer slaughtered to administer to the pomp of temples, or to provide ornaments for palaces. The ivory tablets of the citizens of ancient Rome (*libri elephantini*) had fallen into disuse; and the toys of modern France were constructed of less splendid materials. At Angola, elephants' teeth had become so plentiful because so useless an article of trade, that in the beginning of the seventeenth century, according to Andrew Battell, an Englishman, who served in the Portuguese armies, the natives "had their idols of wood in the midst of their towns, fashioned like a negro, and at the foot thereof was a great heap of elephants' teeth, containing three or four tons of them; these were piled in the earth, and upon them were set the skulls of dead men, which they had slain in the wars, in monument of their victory." The people of Angola and Congo, when the Portuguese first established themselves there, were found to have preserved an immense number of elephants' teeth, for centuries, and had applied them to such superstitious uses. As long as any part of the stock remained, the vessels of Portugal carried large quantities to Europe: and this traffic formed one of the most profitable branches of the early trade with Africa. About the middle of the seventeenth century the store was exhausted. But the demand for ivory which had been thus renewed in Europe, after the lapse of so many centuries, offered too great a temptation to the poor African to be allowed by him to remain without a supply. The destruction of elephants for their teeth was again unremittingly pursued throughout those extensive forests; and that havoc has gone on with little, if any, diminution, to our own day.

It would be difficult to estimate with any pretension to accuracy the present consumption of ivory in Europe. Its use must have been considerably diminished, on the one hand, by the changes of taste, which have dispensed with the ivory beds, and ivory chairs, that adorned the palaces of princes in the age of Leo X.; and have displaced the inlaid tables and cabinets of a century later, by articles of furniture distinguished rather for the excellence of their workmanship than for the cost of their material. But, on the other hand, the increase of comforts and luxuries amongst the middle classes of society, and the love of tasteful ornament which has descended from the palace to the cottage, (one satisfactory symptom of intellectual advancement), has probably increased the consumption of ivory in smaller articles. We understand that at Dieppe there are at present eleven flourishing manufactories of articles in ivory, from which various specimens of art, from the commonest piece of turnery to the most elaborate carving, are dispersed throughout the continent. Much is employed for crucifixes, and other appendages of Roman Catholic worship. In our own country, the demand for elephants' teeth, to be employed in the manufacture of musical instruments, plates for miniatures, boxes, chess-men, billiard-balls, mathematical rules, and small pieces of carving, is much more considerable than might occur to a superficial observation. In 1827, the customs upon elephants' teeth, the duty being 20s. per cwt., amounted to £3,257, exhibiting an importation of 364,784 lbs. In eleven years, from 1788 to 1798, 18,914 cwts. of ivory were imported, which shows an average annual importation of 192,579 lbs. In 1841, 5,712 cwts. of elephants' teeth were imported into Great Britain; and in 1842, 6,282 cwts. Of these quantities 1,282 cwts. were re-exported in 1841; and 1,472 cwts. in 1842. The principal supply of this article is from the East Indies and Ceylon; and next, from the west coast of Africa.

The average weight of an elephant's tusk is about 60 lbs. To have produced, therefore, 364,784 lbs. of ivory, the import of 1827, 6,080 tusks must have been procured. This fact assumes the annual slaughter of at least 3,040 elephants. But the real havoc is much greater. Mr. Burchell, in his travels in Africa, met with some elephant hunters, who had shot twelve elephants, which, however, produced no more than two hundred pounds weight of ivory, as all the animals excepting one happened to be females. If any thing like the same ill-luck, or want of skill, attended all the African elephant hunters, upwards of forty thousand of these animals would be annually slain to supply our demand for ivory baubles. But this circumstance is, of course, an extraordinary one; and we only mention it to show the necessary waste of elephant life, in the supply of our commercial wants.

There is a peculiarity in the commerce of elephants' teeth which forcibly arrests the imagination. Ivory is not an article of paramount necessity. The fine marbles would answer the purposes of statuary better, even if the ancient art of sculpture in ivory were restored; and the harder woods are quite as useful in the manufacture of furniture. It is required only for ornaments which are by no means suited to every taste; for modern Europeans have not a passion for ivory, as the Romans are said, by M. de Caylus, to have had. And yet the demand in this country, of which we hear and see little, gives activity to whole tribes of Africans;—makes elephant-hunting a trade;—exposes man to the most appalling dangers, and the severest privations; and spreads terror among thousands of these unoffending animals, who appear to have a natural right, which they have enjoyed from the creation, to the immense savannas upon which they pasture.

Note D.—*Fossil Elephants and the Mammoth*

Fossil elephants have been found in almost every part of the known world, in Europe, Asia, Africa, and not less in America; in the valleys formed by rivers, and on the high neighbourhood of the Andes, of which the specimens sent to Paris by Humboldt, from Villa d'Ibarra, are examples; in the scorching regions of the torrid zone, and on the icy shores of the frozen ocean. England, France, and Germany, possess amongst other countries their share of these relics of a former world, as the fossil bones of Kirkdale, Bondi, and the Hartz, amply testify. They are commonly found in the moveable and superficial beds of the earth, and particularly in those alluvial deposits which fill up the bottom of valleys, or which border the courses of rivers; they are rarely covered by rocks, and are most frequently accompanied by other fossil bones of known genera of quadrupeds, and often by marine or fresh-water shells. With but very few exceptions they are found in unconnected heaps; but in those situations in which whole skeletons are found, they appear as it were buried in a kind of clay, and in some instances even the skin and flesh are preserved, as in that described by Gabriel Sarytschew, in his voyage along the north-eastern coast of Siberia, and that of Mr. Adams, discovered near the mouth of the Lena. The great depository of elephants' bones, however, appears to be Asiatic Russia, and indeed, so numerous are they that the natives carry on a very extensive trade in the fossil ivory found there, and known by the name of *mammontovakost*, or mammoth's teeth, which they suppose belong to an animal which they have named the Mammoth, believing it lives like the mole, burrowing under the earth, but dies as soon as it sees the daylight. This curious notion they seem to have held in common with the Chinese; for a writer of theirs on natural history of the sixteenth century named Bun-zoo-gann-mu, has given a detail of the habits of an animal which he calls *tienschu*, very closely resembling those ascribed to the mammoth.

The mammoth described by Mr. Adams, in the fifth volume of the 'Memoirs of the Academy of St. Petersburgh,' was first discovered by a Tongouse fisherman in the year 1799, on the banks of the Icy sea, near the mouth of the Lena, in a large misshapen block of ice. In the following year this became separated from the surrounding masses, but in the subsequent summer, the ice having melted away one whole side, one tusk of the animal was distinctly visible. The gradual development of this remarkable creature continued from year to year till the fifth after its discovery, when, in consequence of the ice having broken up early, it was drifted ashore, and the fisherman, in the month of March 1804, despoiled it of its tusks, which he sold for fifty rubles. Two years after this, Mr. Adams, who was travelling with Count Golovkin's embassy to China, hearing of this at Iakutsck, made a journey to the spot for the purpose of seeing it. He found the skeleton perfect, with the exception of one foot, but the flesh had been given by the natives of Iakutsck to their dogs, and the wild beasts in the neighbourhood had also assisted in consuming what had been left. The greater part of the skeleton was found connected by its natural ligaments, and those bones which were separated were collected in the neighbourhood. The head was covered with a dry skin, the ball of one eye was remaining, and one ear furnished with a tuft of hair. The brain was found dried up in the skull; the neck ornamented with a long mane; the skin covered with black hairs, and reddish kind of fur or wool; and the weight of the skin which remained so great as to require the hard labour of ten men to remove it; besides which, at least thirty pounds of hair were collected from the ground. The animal was a male, and its tusks were nine feet in length. It was purchased by the emperor of Russia for 8,000 roubles, and placed by him in the Academy of St. Petersburgh.

The islands north of Siberia, opposite the coast separating the mouth of the Lerna from that of the Indigirska, are so remarkable for the immense quantity of these fossil bones, that the editor of Billing's Voyage states, "every island is formed of the bones of this extraordinary animal, of the horns and skulls of buffaloes, or animals nearly resembling them, and of some rhinoceros' horns." "*Description*," says Cuvier, "*tres exagerée sans doute, mais qui prouve à quel point ces os y sont abondans.*"

In America fossil elephant bones are found, particularly in the state of Kentucky, along the banks of the Ohio, and the most remarkable assemblage are found at Big Bone Lick, which was closely examined by Governor Clarke, and whence numerous specimens were sent by him to Washington. Humboldt also discovered part of a fossil tusk at Villa de Ibarra, in the province of Quito in Peru, a hundred and seventeen toises above the level of the sea.

In examining these bones it is a remarkable circumstance, that they very nearly resemble each other in character, from whatever country or climate they may have been brought, and present sufficiently strong characters to determine a new species. Although in height they resemble the Indian or Asiatic elephant, they differ from it in the greater number of laminæ forming each molar tooth, and consequently an equal portion being employed in mastication, more laminæ are bared. Mr. Corse says, that in the Indian elephant, ten or twelve laminæ are all which are exposed, but in the mammoth often as many as twenty-four are seen, and the enamel is less wavily disposed than in the former. The tusks generally are not more curved than in the Indian elephant, though occasionally they are found to assume an elliptical or semicircular figure; but this may have originated from accidental circumstances, which have caused their growth in such direction as to prevent their being used, and therefore they have by their natural growth acquired this curve; a circumstance frequently observed in our domestic animals, as rats, &c., in which the cuspid teeth having accidentally taken such direction as to prevent their use, continue to grow in a circular manner, so as to prevent the animal opening its mouth. One other and very striking peculiarity is the hair; in this, the mammoth differs particularly from the Indian or African elephant, in having a strong mane, and in the body being covered with long and short hairs, the former of these from twelve to fifteen inches in length, as thick as a horse's mane, and of a brown colour, whilst the latter are about nine inches long, are finer, and of a yellowish colour, but the roots of both are embedded in a fine, softish, curly, bright yellow wool, which covers a deep gray skin. This covering of hair evidently proves that the animal was intended for a cold climate; and by what means its bones have been conveyed into the regions of South America, where such warm clothing was not required, save by allowing the occurrence of some great convulsion of nature, and that by water, it would be difficult to account.

In 1826, Mr. Ranking published a very amusing and interesting work, entitled 'Historical Researches on the Wars and Sports of the Mongols and Romans,' in which he has taken great pains to prove that the fossil bones of elephants, and other animals so frequently found, are the remains of those animals which were slaughtered in the grand hunting parties of the former, or the amphitheatrical exhibitions of the latter: and in support of that part of his opinion which relates to the Romans, he shows, that in almost every instance where the remains of a theatre have been found, there have been also discovered fossi bones in the neighbourhood. That to a certain extent this is true no one can doubt, and even Cuvier himself readily admits it, but with this difference, that such fossil bones are found in a more recent soil; whilst the remains of Blumenbach's *E. Primigenius* are deposited in a soil of much more ancient existence; and the bones themselves differ in many very remarkable points from those of the present known species. In the course of his work, Mr. Ranking also speaks of the great collection of fossil bones already mentioned as being found on the coasts of Siberia, which he unhesitatingly states to belong to the *Trichechus Rosmarus*, or walrus, an animal which in every respect differs from the bones found there. And when he refers to the elephant discovered at the mouth of the Lerna, the authenticity of which, from its skeleton being found almost entirely connected, he cannot disallow, he states, that it was probably one of those which Genghis Khan sent to his Siberian relatives, and, not improbably, was destroyed by a sudden irruption of the sea.

CHAP. II.

OF THE RHINOCEROS.

Next to the elephant, the rhinoceros is the most powerful of animals. It is usually found twelve feet long from the tip of the nose to the insertion of the tail; from six to seven feet high; and the circumference of its body is nearly equal to its length. It is, therefore, equal to the elephant in bulk: and if it appears much smaller to the eye, the reason is, that its legs are much shorter. Words can convey but a very confused idea of this animal's shape; and yet there are few so remarkably formed: its head is furnished with a horn, growing from the snout, sometimes three feet and a half long; and but for this, that part would have the appearance of the head of a hog; the upper lip, however, is much longer in proportion, ends in a point, is very pliable, serves to collect its food, and deliver it into the mouth: the ears are large, erect, and pointed; the eyes are small and piercing; the skin is naked, rough, knotty, and lying upon the body in folds, after a very peculiar fashion: there are two folds very remarkable; one above the shoulders, and another over the rump: the skin, which is of a dirty brown colour, is so thick as to turn the edge of a scimitar, and to resist a musket-ball; the belly hangs low; the legs are short, strong, and thick, and the hoofs divided into three parts, each pointing forward.[1]

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[1] The natural history of the rhinoceros has been rendered more complete by Mr. Thomas's anatomical description of a male animal of this singular species, which had been brought to this country alive from the East Indies This creature appeared to enjoy good health until a few days before his death, when he was attacked with difficulty of breathing. He had not probably arrived at full growth, for he was scarcely so high as a heifer of two years old, and the

Such is the general outline of an animal that appears chiefly formidable from the horn growing from its snout; and formed rather for war than with a propensity to engage. This horn is sometimes found from three to three feet and a half long, growing from the solid bone, and so disposed as to be managed to the greatest advantage. It is composed of the most solid substance; and pointed so as to inflict the most fatal wounds. The elephant, the boar, or the buffalo, are obliged to strike transversely with their weapons; but the rhinoceros employs all his force with every blow; so that the tiger will more willingly attack any other animal of the forest, than one whose strength is so justly employed. Indeed, there is no force which this animal has to apprehend: defended on every side by a thick horny hide, which the claws of the lion or the tiger are unable to pierce, and armed before with a weapon that even the elephant does not choose to oppose. The missionaries assure us, that the elephant is often found dead in the forests, pierced with the horn of a rhinoceros; and though it looks like wisdom to doubt whatever they tell us, yet I cannot help giving credit to what they relate on this occasion, particularly when confirmed by Pliny. The combat between these two, the most formidable animals of the forest, must be very dreadful. Emanuel, king of Portugal, willing to try their strength, actually opposed them to each other; and the elephant was defeated.

But though the rhinoceros is thus formidable by nature, yet imagination has not failed to exert itself in adding to its terrors. The scent is said to be most exquisite; and it is affirmed that it consorts with the tiger. It is reported also, that when it has overturned a man, or any other animal, it continues to lick the flesh quite from the bone with its tongue, which is said to be extremely rough. All this, however, is fabulous: the scent, if we may judge from the expansion of the olfactory nerves, is not greater than that of a hog, which we know to be indifferent; it keeps company with the tiger, only because they both frequent watery places in the burning climates where they are bred; and as to its rough tongue, that is so far from the truth, that no animal of near its size has so soft a one. "I have often felt it myself," says Ladvocat, in his description of this animal; "it is smooth, soft, and small, like that of a dog, and to the feel it appears as if one passed the hand over velvet; I have often seen it lick a young man's face who kept it, and both seemed pleased with the action."

The rhinoceros which was shown at London in 1739, and described by Dr. Parsons, had been sent from Bengal. Though it was very young, not being above two years old, yet the charge of its carriage and food from India cost near a thousand pounds. It was fed with rice, sugar, and hay: it was daily supplied with seven pounds of rice, mixed with three of sugar, divided into three portions; it was given great quantities of hay and grass, which it chiefly preferred; its drink was water, which it took in great quantities. It was of a gentle disposition, and permitted itself to be touched and handled by all visitors, never attempting mischief, except when abused, or when hungry; in such a case there was no method of appeasing its fury but by giving it something to eat. When angry, it would jump up against the walls of its room with great violence, and make many efforts to escape, but seldom attempted to attack its keeper, and was always submissive to his threats. It had a peculiar cry, somewhat a mixture between the grunting of a hog and the bellowing of a calf.

The age of these animals is not well known; it is said by some, that they bring forth at three years old; and if we may reason from analogy, it is probable they seldom live till above twenty. That which was shown in London was said by its keeper to be eighteen years old, and even at that age he pretended to consider it as a young one

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horn, which is affixed to the upper lip of the adult rhinoceros, was here just beginning to sprout. The disease had carried him off before he had attained his third year. In the course of this time he had become perfectly tame and docile; but did not manifest the smallest attachment to his keeper. His food was chiefly hay, oats, and potatoes, and also fresh vegetables; his consumption of which was greater than that of two or three working horses. Mr. T. found that the general structure of this animal corresponded with what is observed in the horse, but that there were the following peculiarities:—The skin, it is well known, is extremely hard and tuberculated, though smoother, and easily cut through with a common knife on the under part of the body; a considerable deal of sliding motion was observable between it and the surface underneath. With respect to the teeth, the incisors were only four in number, two situated in each jaw, and these were placed at a great distance from each other. In the head of another rhinoceros (five years old) seen by Mr. T., and where the soft parts had been removed, there were two smaller teeth placed, one on each side of those in the lower jaw. The *molares* were only eight in number. Their form had been noticed by Mr. Horne in the 'Philosophical Transactions' for 1799. But the most remarkable peculiarity in the anatomy of the animal is the connexion of four processes, arising by distinct tendons from the internal and posterior portion of the sclerotic coat, with the choroid coat of the one at its broadest diameter. These processes have a muscular appearance, and would seem to have the effect, when acting conjointly, of adapting the organ to the cognizance of more distant objects; for at their terminations they completely encircle the eye, and may therefore, by contracting, shorten the axis of vision, and bring the retina nearer to the crystalline lens. The lens itself is of a singular form, being nearly spherical, with the anterior surface a little flattened. The *pigmentum nigrum* was found to be confined to the inside of the choroid coat, without any structure similar to the *lapidum lundum*. Notwithstanding the opinion generally entertained, of the rhinoceros having bad sight, Mr. T. is led to conclude from his examination of the several appendages of that organ, that the animal is not only not deficient in quickness of vision, but that he may perhaps be superior to other animals in that particular.—ED.

however, it died shortly after, and that probably in the course of nature.

The rhinoceros is a native of the deserts of Asia and Africa, and is usually found in those extensive forests that are frequented by the elephant and the lion. As it subsists entirely upon vegetable food, it is peaceful and harmless among its fellows of the brute creation; but, though it never provokes to combat, it equally disdains to fly. It is every way fitted for war, but rests content in the consciousness of its security. It is particularly fond of the prickly branches of trees, and is seen to feed upon such thorny shrubs as would be dangerous to other animals, either to gather or to swallow. The prickly points of these, however, may only serve to give a poignant relish to this animal's palate, and may answer the same grateful ends in seasoning its banquet that spices do in heightening ours.

In some parts of the kingdom of Asia, where the natives are more desirous of appearing warlike than showing themselves brave, these animals are tamed, and led into the field to strike terror into the enemy; but they are always an unmanageable and restive animal, and probably more dangerous to the employers than those whom they are brought to oppose.

The method of taking them is chiefly watching them, till they are found either in some moist or marshy place, where, like hogs, they are fond of sleeping and wallowing. They then destroy the old one with firearms; for no weapons that are thrown by the force of men are capable of entering this animal's hide. If, when the old one is destroyed, there happens to be a cub, they seize and tame it: these animals are sometimes taken in pit-falls covered with green branches, laid in those paths which the rhinoceros makes in going from the forest to the river side.

There are some varieties in this animal, as in most others; some of them are found in Africa with a double horn, one growing above the other. This weapon, if considered in itself, is one of the strongest and most dangerous that nature furnishes to any part of the animal creation. The horn is entirely solid, formed of the hardest bony substance, growing from the upper maxillary bone, by so strong an apophyse, as seemingly to make but one part with it. Many are the medicinal virtues that are ascribed to this horn, when taken in powder; but these qualities have been attributed to it without any real foundation, and make only a small part of the many fables which this extraordinary animal has given rise to.

NOTE.—*Varieties of the Rhinoceros.*

The two-horned rhinoceros differs from the other in the appearance of its skin; which, instead of vast and regularly marked folds, resembling armour, has merely a slight wrinkle across the shoulders and the hinder parts, with a few fainter wrinkles on the sides; so that, in comparison with the common rhinoceros, it appears almost smooth. The principal distinction, however, consists in the nose being furnished with two horns, one of which is smaller than the other, and situated above it. These horns are said to be loose when the animal is in a quiet state, but when he is angry, they become firm and immoveable. Le Vaillant asserts, that when these animals are at rest, they always place themselves in the direction of the wind, with their noses towards it, in order to discover by their smell the approach of any enemies. When irritated they tear up the ground furiously with their horns, throwing the earth and stones to a vast distance over their heads.

Mr. Bruce's account of these animals is interesting.—"Besides the trees capable of most resistance," says this traveller, "there are in the vast forests within the rains, trees of a softer consistence, and of a very succulent quality, which seem to be destined for the principal food of this animal. For the purpose of gaining the highest branches of these trees, his upper lip is capable of being lengthened out so as to increase his power of laying hold of it, in the same manner as the elephant does with his trunk.—With this lip, and the assistance of his tongue, he pulls down the upper branches, which have most leaves, and these he devours first. Having stripped the tree of its branches, he does not immediately abandon it; but, placing his snout as low in the trunk as he finds his horns will enter, he rips up the body of the tree, and reduces it to thin pieces like so many laths; and when he has thus prepared it, he embraces as much of it as he can in his monstrous jaws, and twists it round with as much ease as an ox would a root of celery, or any small plant. When pursued, and in fear, he possesses an astonishing degree of swiftness, considering his size, the apparent unwieldiness of his body, his great weight before, and the shortness of his legs. He has a kind of trot, which, after a few minutes, increases in a great proportion, and takes in a considerable distance; but this is to be understood with a degree of moderation. It is not true, that in a plain he beats the horse in swiftness. I have passed him with ease, and seen many worse mounted do the same; and though it is certainly true that a horse can very seldom come up with him, this is owing to his cunning, and not to his swiftness. He makes constantly from wood to wood, and forces himself into the thickest parts of them. The trees that are dead or dry, are broken down as with a cannon shot, and fall behind him and on his sides in all directions. Others that are more pliable, greener, or fuller of sap, are bent back by his weight and the velocity of his motions. And after he has passed, restoring themselves like a green branch to their natural position, they often sweep the incautious pursuer and his horse from the ground, and dash them in pieces against the surrounding trees. The eyes of the rhinoceros are very small; he seldom turns his head, and therefore sees nothing but what is before him. To this he owes his death, and never escapes if there is so much plain as to enable the horse to get before him. His pride and fury then make him lay aside all thoughts of escaping, but by victory over his enemy. He stands for a moment at bay, then, at a start, runs straight forward at the horse, like the wild boar, which, in his manner of action, he very much resembles. The horse, however, easily avoids him by turning short to one side, and this is the fatal instant: the naked man with the sword, drops from behind the principal horseman, and, unseen by the rhinoceros, who is seeking his enemy the horse, he gives him a stroke across the tendon of the heel, which renders him incapable of further flight or resistance."

The double-horned rhinoceros has a formidable adversary in a fly; and this insect persecutes him so unremittingly, that it must eventually subdue him, were it not for a stratagem which he practises for his preservation. In the night, when the fly is at rest, the rhinoceros chooses a convenient place, and there rolling in the mud, clothes himself with a kind of case, which defends him against his adversary the following day. The wrinkles and plaits of his skin serve to keep this plaster firm upon him, all but about the hips, shoulders, and legs, where it cracks and falls off, by motion, and leaves him exposed in those parts. The itching and pain which follow, occasion him to rub himself in those parts against the roughest trees; and this is probably one cause of the numerous pustules or tubercles that are perceivable upon his skin. The pleasure he receives from this employment, and the darkness of the night, deprive him of his usual vigilance and attention; and the noise he makes is heard at so considerable a distance, that the hunters, guided by the sound, steal secretly upon him; and while lying on the ground, wound him with their javelins in the belly, where the wound is mortal.

The assertion that the skin of this rhinoceros is hard or impenetrable, like a board, is very incorrect. In his wild state he is slain by javelins thrown from the hand, some of which enter his body to a great depth. A musket shot will go through him, unless interrupted by a bone; and the Abyssinians kill him with the clumsiest arrows that ever were formed, and cut him to pieces afterwards with the most wretched knives. Mr. Sparrman informs us, that having opened one of these animals he found the stomach to be four feet in length and two in diameter, to which was annexed a tube or canal, twenty-eight feet long, and six inches in diameter; the heart was eighteen inches in length, and the kidneys the same in breadth: the liver, when measured from right to left, was three feet and a half in breadth, and about thirty inches deep, as it hangs in the animal's body when in a standing position. The cavity in the skull, which contained the brains, was, however, but small, being only six inches long and four deep. The Hottentots ascribe many medicinal virtues to the dried blood of the rhinoceros; and some of them appear remarkably fond of its flesh, though it is hard and full of sinews.

The Sukotyro is an animal of a new genus. Only one species of it has been yet discovered, and it is termed by naturalists the Javan sukotyro. It has a horn on each side of the head close to the orbits, and is furnished with a short, narrow, upright mane, along the back; which extends from the back of the head to the rump. The sukotyro is thus named by the Chinese. It is a very odd-shaped beast; it is of the bigness of a large ox, with a snout like a hog, having two long rough ears, and thick bushy tail; the eyes are placed upright in the head, quite different from other beasts; on the sides of the head, next to the eyes, stand two long horns, or rather tusks, not quite so thick as those of the elephant. The feet are each armed with four knobs, or half hoofs, on their fore-parts; the nose is very broad, and truncated; the ears very large, and slouching; the tail covered with flowing hairs, and reaches lower than the middle of the hind-legs; the skin is smooth, and entirely free from plaits, like those on the one-horned rhinoceros. It feeds on herbage and is but seldom taken.

CHAP. III.

THE HIPPOPOTAMUS.

The hippopotamus is an animal as large, and not less formidable, than the rhinoceros; its legs are shorter, and its head rather more bulky than that of the animal last described. We have had but few opportunities in Europe of examining this formidable creature minutely; its dimensions, however, have been pretty well ascertained, by a description given us by Zerenghi, an Italian surgeon, who procured one of them to be killed on the banks of the river Nile. By his account it appears that this terrible animal, which chiefly resides in the waters of that river, is above seventeen feet long from the extremity of the snout to the insertion of the tail; above sixteen feet in circumference round the body, and above seven feet high: the head is near four feet long, and above nine feet in circumference. The jaws open about two feet wide, and the cutting teeth, of which it hath four in each jaw, are above a foot long.

Its feet in some measure resemble those of the elephant, and are divided into four parts. The tail is short, flat, and pointed; the hide is amazingly thick, and though not capable of turning a musket-ball, is impenetrable to the blow of a sabre; the body is covered over with a few scattered hairs of a whitish colour. The whole figure of the animal is something between that of an ox and a hog, and its cry is something between the bellowing of the one and the grunting of the other.

This animal, however, though so terribly furnished for war, seems no way disposed to make use of its prodigious strength against an equal enemy; it chiefly resides at the bottom of the great rivers and lakes of Africa, the Nile, the Niger, and the Zara; there it leads an indolent kind of life, and seems seldom disposed for action, except when excited by the calls of hunger. Upon such occasions, three or four of them are often seen at the bottom of a river, near some cataract, forming a kind of line, and seizing upon such fish as are forced down by the violence of the stream. In that element they pursue their prey with great swiftness and perseverance; they swim with much force, and remain at the bottom for thirty or forty minutes, without rising to take breath. They traverse the bottom of the stream as if walking upon land, and make a terrible devastation where they find plenty of prey. But it often happens, that this animal's fishy food is not supplied in sufficient abundance; it is then forced to come upon land, where it is an awkward and unwieldy stranger; it moves but slowly, and as it seldom forsakes the margin of the river, it sinks at every step it takes; sometimes, however, it is forced by famine up into the higher grounds, where it commits dreadful havoc among the plantations of the helpless natives, who see their possessions destroyed, without daring to resist their invader. Their chief method is by lighting fires, striking drums, and raising a cry to frighten it back to its favourite element; and as it is extremely timorous upon land, they generally succeed in their endeavours. But if they happen to wound, or otherwise irritate it too closely, it then becomes formidable to all that oppose it: it overturns whatever it meets, and brings forth all its strength, which it seemed not to have discovered before that dangerous occasion. It possesses the same inoffensive disposition in its favourite element, that it is found to have upon land; it is never found to attack the mariners in their boats as they go up or down the stream; but should they inadvertently strike against it, or otherwise disturb its repose, there is much danger of its sending them at once to the bottom. "I have seen," says a mariner, as we find it in Dampier, "one of these animals open its jaw, and seizing a boat between its teeth, at once bite and sink it to the bottom. I have seen it, upon another occasion, place itself under one of our boats, and, rising under it, overset it, with six men who were in it; who, however, happily received no other injury." Such is the great strength of this animal; and from hence, probably, the imagination has been willing to match it in combat against others more fierce, and equally formidable. The crocodile and shark have been said to engage with it, and yield an easy victory; but as the shark is only found at sea, and the hippopotamus never ventures beyond the mouth of fresh-water rivers, it is most probable that these engagements never occurred; it sometimes happens, indeed, that the princes of Africa amuse themselves with combats, on their fresh-water lakes, between this and other formidable animals; but whether the rhinoceros or the crocodile are of this number we have not been particularly informed. If this animal be attacked on land, and find itself incapable of vengeance from the swiftness of its enemy, it immediately returns to the river, where it plunges in head foremost, and, after a short time, rises to the surface, loudly bellowing, either to invite or intimidate the enemy; but though the negroes will venture to attack the shark or the crocodile in their natural element, and there destroy them, they are too well apprized of the force of the hippopotamus to engage it; this animal, therefore, continues the uncontrolled master of the river, and all others fly from its approach, or become an easy prey.

As the hippopotamus lives upon fish and vegetables, so it is probable the flesh of terrestrial animals may be equally grateful: the natives of Africa assert, that it has often been found to devour children and other creatures that it was able to surprise upon land; yet, as it moves but slowly, almost every creature, endued with a common share of swiftness, is able to escape it; and this animal, therefore, seldom ventures from the river side, but when pressed by the necessities of hunger, or of bringing forth its young.

The female always comes upon land to bring forth, and it is supposed that she seldom produces above one at a time. Upon this occasion these animals are particularly timorous, and dread the approach of a terrestrial enemy; the instant the parent hears the slightest noise it dashes into the stream, and the young one is seen to follow it with equal alacrity.

The young ones are said to be excellent eating; but the negroes, to whom nothing that has life comes amiss, find an equal delicacy in the old. Dr. Pococke has seen their flesh sold in the shambles like beef; and it is said that their breast, in particular, is as delicate eating as veal. As for the rest, these animals are found in great numbers, and as they produce very fast, their flesh might supply the countries where they are found, could those barbarous regions produce more expert huntsmen. It may be remarked, however, that this creature, which was once in such plenty at the mouth of the Nile, is now wholly unknown in Lower Egypt, and is nowhere to be found in that river, except above the cataracts.

CHAP. IV.

THE CAMELOPARD.

Were we to be told of an animal so tall, that a man on horseback could with ease ride under its belly, without stooping, we should hardly give credit to the relation; yet of this extraordinary size is the camelopard, an animal that inhabits the deserts of Africa, and the accounts of which are so well ascertained, that we cannot deny our assent to their authority. It is no easy matter to form an adequate idea of this creature's size, and the oddity of its formation. It exhibits somewhat the slender shape of the deer, or the camel, but destitute of their symmetry, or their easy power of motion. The head somewhat resembles that of the deer, with two round horns, near a foot long, and which, it is probable, it sheds as deer are found to do; its neck resembles that of a horse; its legs and feet those of the deer, but with this extraordinary difference, that the fore-legs are near twice as long as the hinder. As these creatures have been found eighteen feet high, and ten from the ground to the top of the shoulder; so allowing three feet for the depth of the body, seven feet remain, which is high enough to admit a man mounted on a middle-sized horse. The hinder part, however, is much lower, so that when the animal appears standing, at rest, it has somewhat the appearance of a dog sitting; and this formation of its legs gives it an awkward and a laborious motion, which, though swift, must yet be tiresome. For this reason the camelopard is an animal very rarely found, and only finds refuge in the most internal desert regions of Africa. The dimensions of a young one, as they were accurately taken by a person who examined its skin, that was brought from the Cape of Good Hope, were found to be as follow: the length of the head was one foot eight inches; the height of the fore-leg, from the ground to the top of the shoulder, was ten feet; from the shoulder to the top of the head was seven; the height of the hind-leg was eight feet five inches; and from the top of the shoulder to the insertion of the tail was just seven feet long.

No animal, either from its disposition or its formation, seems less fitted for a state of natural hostility; its horns are blunt, and even knobbed at the ends; its teeth are made entirely for vegetable pasture; its skin is beautifully speckled with white spots, upon a brownish ground; it is timorous and harmless, and notwithstanding its great size, rather flies from, than resists, the slightest enemy; it partakes very much of the nature of the camel, which it so nearly resembles; it lives entirely upon vegetables, and when grazing, is obliged to spread its fore-legs very wide in order to reach its pasture; its motion is a kind of pace, two legs on each side moving at the same time, whereas in other animals they move transversely. It often lies down with its belly to the earth, and, like the camel, has a callous substance upon its breast, which, when reposed, defends it from injury. This animal was known to the ancients, but has been very rarely seen in Europe. One of them was sent from the East to the Emperor of Germany, in the year 1559; but they have often been seen tame at Grand Cairo in Egypt; and, I am told, there are two there at present. When ancient Rome was in its splendour, Pompey exhibited at one time no less than ten upon the theatre. It was the barbarous pleasure of the people, at that time, to see the most terrible and the most extraordinary animals produced in combat against each other. The lion, the lynx, the tiger, the elephant, the hippopotamus, were all let loose promiscuously, and were seen to inflict indiscriminate destruction.

Supplementary Note.

The absence of the camelopard or giraffe from Europe, for three centuries and a half, naturally induced a belief that the descriptions of this animal were in great part fabulous—that a creature of such extraordinary height and apparent disproportions was not to be found amongst the actual works of nature; and that it more properly belonged to the group of chimeras with which the regions of imagination are tenanted,—the unicorns, and sphinxes, and satyrs, and cynocephali, of ancient poets and naturalists.

Buffon, and other zoologists, fell into the common error of describing the giraffe as having his fore-legs twice as long as his hind. It was not till within the last fifty years that we obtained any very precise notions of the form and habits of the giraffe; and we principally owe them to Le Vaillant, whose narrative was, indeed, originally considered, in some degree, fabulous, but the correctness of whose statements, in this particular, has since been abundantly confirmed.

We shall be enabled to describe the appearance and the habits of the giraffe somewhat minutely, as they have been observed in the menageries of the kings of England and of France. But Le Vaillant saw the animal in its natural state; and we may, therefore, properly translate a part of his description. "The giraffe ruminates, as every animal does that possesses, at the same time, horns and cloven feet. It grazes also in the same way; but not often, because the country which it inhabits has little pasturage. Its ordinary food is the leaf of a sort of mimosa, called by the natives *kanaap*, and by the colonists, *kameel-doorn*. This tree being only found in the country of the Namaquas, may probably afford a reason why the giraffe is there fixed, and why he is not seen in those regions of Southern Africa where the tree does not grow. Doubtless, the most beautiful part of his body is the head. The mouth is small; the eyes are brilliant, and full. Between the eyes, and above the nose, is a swelling, very prominent and well defined. This prominence is not a fleshy excrescence, but an enlargement of the bony substance; and it seems to be similar to the two little lumps, or protuberances, with which the top of his head is armed, and which, being about the size of a hen's egg, spring, on each side, at the commencement of the mane. His tongue is rough, and terminates in a point. The two jaws have, on each side, six molar teeth; but the lower jaw has, beyond these, eight incisive teeth, while the upper jaw has none. The hoofs, which are cleft, and have no nails, resemble those of the ox. We may remark, at first sight, that those of the fore-feet are larger than those of the hind. The leg is very slender, but the knees have a prominence, because the animal kneels when he lies down. There is also a larger callosity on the breast, which would lead one to conclude that he generally rests on that part. If I had not myself killed the giraffe I should have believed, as have many naturalists, that the fore-legs are much longer than the hind. This is an error; for the legs have in general the proportion of those of other quadrupeds. I say in general, because in this genus there are varieties, as there are in animals of the same species. Thus, for example, mares are lower before than stallions of an equal height. What has led to this error, as to the difference between the legs of the giraffe, is the height of the withers, which, according to the animal's age, may exceed the height of the rump by sixteen or twenty inches, and which disproportion, when we see it at a distance, must have led to the belief that its legs are longer before than behind. . . . . . His defence, as that of the horse and other hoofed animals, consists in kicks; and his hinder limbs are so light, and his blows so rapid, that the eye cannot follow them. They are sufficient for his defence against the lion. He never employs his horns in resisting any attack. . . . . The giraffes, male and female, resemble each other in their exterior, in their youth. Their obtuse horns are then terminated by a knot of long hair: the female preserves this peculiarity some time, but the male loses it at the age of three years. The hide, which is at first of a light red, becomes of a deeper colour as the animal advances in age, and is at length of a yellow brown in the female, and of a brown approaching to black in the male. By this difference of colour the male may be distinguished from the female at a distance. The skin varies in both sexes, as to the distribution and form of the spots. The female is not so high as the male, and the prominence of the front is not so marked. She has four teats. According to the account of the natives, she goes with young about twelve months, and has one at a birth."

The giraffe which died in the king's menagerie at Windsor arrived in England in August 1827, and was a present from the pasha of Egypt to his Majesty. About the same period another giraffe arrived at Marseilles, being also a present from the pasha of Egypt to the king of France. That animal was conveyed to the Jardin des Plantes, and for several months occupied almost the exclusive attention of the lively Parisians. Every fashion was *a la giraffe*; and even the ladies wore dresses, and the men carried handkerchiefs, bearing the portrait of the animal. Both of these individuals were females; and they were each taken very young by some Arabs, who fed them with milk. The governor of Sennaar, a large town of Nubia, obtained them from the Arabs, and forwarded them to the pasha of Egypt. This ruler determined on presenting them to the kings of England and France; and as there was some difference in size, the consuls of each nation drew lots for them. The shortest and weakest fell to the lot of England. The giraffe destined for our sovereign was conveyed to Malta, under the charge of two Arabs, and was from thence forwarded to London in the Penelope merchant vessel, and arrived on the 11th of August. The animal was conveyed to Windsor, two days after, in a spacious caravan. The following were its dimensions, as measured shortly after its arrival at Windsor:—

	Ft.	In.
From the top of the head to the bottom of the hoof,	10	8
Length of the head,	1	9
From the top of the head to the neck root,	4	0
—— neck root to the elbow,	2	3
—— elbow to the upper part of the knee,	1	8
—— upper part of the knee to the fetlock joint,	1	11
—— fetlock joint to the bottom of the hoof,	0	10
Length of the back,	3	1
From the croup to the bottom of the hoof,	5	8
—— hough to the bottom of the hoof,	2	9
Length of the hoofs,	0	7½

She grew somewhat after her arrival, but her health was never good. Her joints appeared to *shoot over*, and she was very weak and crippled. Indeed, so great was the weakness of her fore-legs, that a pulley was constructed, being suspended from the ceiling of her hovel, and fastened round her body, for the purpose of raising her on her legs without any exertion on her part. When she first arrived, she was exceedingly playful, and perfectly harmless; but she became afterwards much less active, although as gentle as before. She appeared to know her keeper, and every object by which she was surrounded attracted her attention.

CHAP. V.

THE CAMEL AND THE DROMEDARY.

These names do not make two distinct kinds, but are only given to a variety of the same animal,[1] which has, however, subsisted time immemorial. The principal, and perhaps the only sensible difference, by which those two races are distinguished, consists in this, that the camel has two bunches upon his back, whereas the dromedary has but one; the latter, also, is neither so large nor so strong as the camel. These two races, however, produce with each other, and the mixed breed formed between them is considered the best, the most patient, and the most indefatigable of all the kind.

Of the two varieties, the dromedary is by far the most numerous, the camel being scarcely found, except in Turkey, and the countries of the Levant; while the other is found spread over all the deserts of Arabia, the southern parts of Africa, Persia, Tartary, and a great part of the Eastern Indies. Thus, the one inhabits an immense tract of country, the other, in comparison, is confined to a province; the one inhabits the sultry countries of the torrid zone, the other delights in a warm, but not a burning climate; neither, however, can subsist, or propagate, in the variable climates towards the north; they seem formed for those countries where shrubs are plenty, and water scarce; where they can travel along the sandy desert without being impeded by rivers, and find food at expected distances; such a country is Arabia, and this, of all others, seems the most adapted to the support and production of this animal.

The camel is the most temperate of all animals, and it can continue to travel several days without drinking. In those vast deserts, where the earth is everywhere dry and sandy, where there are neither birds nor beasts, neither insects nor vegetables, where nothing is to be seen but hills of sand and heaps of stone, there the camel travels, posting forward, without requiring either drink or pasture, and is often found six or seven days without any sustenance whatsoever. Its feet are formed for travelling upon sand, and utterly unfit for moist or marshy places; the inhabitants, therefore, find a most useful assistant in this animal, where no other could subsist, and by its means cross those deserts with safety, which would be unpassable by any other method of conveyance.

An animal, thus formed for a sandy and desert region, cannot be propagated in one of a different nature. Many vain efforts have been tried to propagate the camel in Spain; they have been transported into America, but have multiplied in neither. It is true, indeed, that they may be brought into these countries, and may, perhaps, be found to produce there, but the care of keeping them is so great, and the accidents to which they are exposed, from the changeableness of the climate, are so many, that they cannot answer the care of keeping. In a few years also they are seen to degenerate; their strength and their patience forsake them; and instead of making the riches, they become the burden of their keepers.

But it is very different in Arabia, and those countries where the camel is turned to useful purposes. It is there considered as a sacred animal, without whose help the natives could neither subsist, traffic, nor travel; its milk makes a part of their nourishment; they feed upon its flesh, particularly when young; they clothe themselves with its hair, which it is seen to moult regularly once a-year; and if they fear an invading enemy their camels serve them in flight, and in a single day they are known to travel above a hundred miles. Thus, by means of the camel, an Arabian finds safety in his deserts; all the armies upon earth might be lost in the pursuit of a flying squadron of this country mounted upon their camels, and taking refuge in solitudes, where nothing interposes to stop their flight, or to force them to wait the invader. Nothing can be more dreary than the aspect of these sandy plains, that seem entirely forsaken of life and vegetation: wherever the eye turns, nothing is presented but a sterile and dusty soil, sometimes torn up by the winds, and moving in great waves along, which, when viewed from an eminence, resemble less the earth than the ocean; here and there a few shrubs appear, that only teach us to wish for the grove—that remind us of the shade in these sultry climates, without affording its refreshment: the return of morning, which, in other places, carries an idea of cheerfulness, here serves only to enlighten the endless and dreary waste, and to present the traveller with an unfinished prospect of his forlorn situation: yet in this chasm of nature, by the help of the camel, the Arabian finds safety and subsistence. There are here and there found spots of verdure, which, though remote from each other, are, in a manner, approximated by the labour and industry of the camel. Thus these deserts which present the stranger with nothing but objects of danger and sterility, afford the inhabitant protection, food, and liberty. The Arabian lives independent and tranquil in the midst of his solitudes; and, instead of considering the vast solitudes spread round him as a restraint upon his happiness, he is, by experience, taught to regard them as the ramparts of his freedom.

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[1] These quadrupeds have six front teeth in the lower jaw, which are rather thin and broad: the canine teeth are a little remote from the rest; in the upper jaw there are three, in the lower two: the upper lip divided; and there are no horns.—Ed.

The camel is easily instructed in the methods of taking up and supporting his burden: their legs, a few days after they are produced, are bent under their belly; they are in this manner loaded, and taught to rise; their burden is every day thus increased, by insensible degrees, till the animal is capable of supporting a weight adequate to its force; the same care is taken in making them patient of hunger and thirst: while other animals receive their food at stated times the camel is restrained for days together, and these intervals of famine are increased in proportion as the animal seems capable of sustaining them. By this method of education they live five or six days without food or water; and their stomach is formed most admirably by nature to fit them for long abstinence; besides the four stomachs, which all animals have that chew the cud, (and the camel is of the number,) it has a fifth stomach, which serves as a reservoir, to hold a greater quantity of water than the animal has an immediate occasion for. It is of a sufficient capacity to contain a large quantity of water, where the fluid remains without corrupting, or without being adulterated by the other aliments; when the camel finds itself pressed with thirst, it has here an easy resource for quenching it; it throws up a quantity of this water, by a simple contraction of the muscles, into the other stomachs, and this serves to macerate its dry and simple food; in this manner, as it drinks but seldom, it takes in a large quantity at a time, and travellers, when straitened for water, have been often known to kill their camels for that which they expected to find within them.

In Turkey, Persia, Arabia, Barbary, and Egypt, their whole commerce is carried on by means of camels; and no carriage is more speedy, and none less expensive, in these countries. Merchants and travellers unite themselves into a body, furnished with camels, to secure themselves from the insults of the robbers that infest the countries in which they live. This assemblage is called a *caravan*, in which the numbers are sometimes known to amount to above ten thousand, and the number of camels is often greater than those of the men: each of these animals is loaded according to his strength, and he is so sensible of it himself, that when his burden is too great, he remains still upon his belly, the posture in which he was laden, refusing to rise, till his burden be lessened or taken away. In general, the large camels are capable of carrying a thousand weight, and sometimes twelve hundred; the dromedary, from six to seven. In these trading journeys, they travel but slowly, their stages are generally regulated, and they seldom go above thirty, or at most about five and thirty miles a-day. Every evening, when they arrive at a stage, which is usually some spot of verdure, where water and shrubs are in plenty, they are permitted to feed at liberty; they are then seen to eat as much in an hour as will supply them for twenty-four; they seem to prefer the coarsest weeds to the softest pasture: the thistle, the nettle, the cassia, and other prickly vegetables, are their favourite food; but their drivers take care to supply them with a kind of paste composition, which serves as a more permanent nourishment. As these animals have often gone the same track, they are said to know their way precisely, and to pursue their passage when their guides are utterly astray; when they come within a few miles of their baiting-place, in the evening, they sagaciously scent it at a distance, and increasing their speed, are often seen to trot with vivacity to their stage.

The patience of this animal is most extraordinary; and it is probable that its sufferings are great; for when it is loaded it sends forth most lamentable cries, but never offers to resist the tyrant that oppresses it. At the slightest sign it bends its knees and lies upon its belly, suffering itself to be loaded in this position; by this practice, the burden is more easily laid upon it than if lifted up while standing; at another sign it rises with its load, and the driver getting upon its back between the panniers, which, like hampers, are placed upon each side, he encourages the camel to proceed with his voice and with a song. In this manner the creature proceeds contentedly forward with a slow uneasy walk, of about four miles an hour, and when it comes to its stage lies down to be unloaded as before.

Mr. Buffon seems to consider the camel to be the most domesticated of all other creatures, and to have more marks of the tyranny of man imprinted on its form. He is of opinion that this animal is not now to be found in a state of nature; that the humps on its back, the callosities upon its breast and its legs, and even the great reservoir for water, are all marks of long servitude and domestic constraint. The deformities he supposes to be perpetuated by generation; and what at first was accident at last becomes nature. However this be, the humps upon the back grow large in proportion as the animal is well fed, and if examined, they will be found composed of a substance not unlike the udder of a cow.

The inhabitants generally leave but one male to wait on ten females, the rest they castrate; and though they thus become weaker, they are more manageable and patient. The female receives the male in the same position as when these animals are loaded; she goes with young for about a year, and like all other great animals, produces but one at a time. The camel's milk is abundant and nourishing, and mixed with water makes a principal part of the beverage of the Arabians. These animals begin to engender at three years of age, and they ordinarily live from forty to fifty years. The genital part of the male resembles that of the bull, but it is placed pointing backwards, so that its urine seems to be ejected in the manner of the female. This, as well as the dung, and almost every part of this animal, is converted to some useful purpose by the keepers. Of the urine, sal ammoniac is made; and of the dung, litter for the horses, and fire for the purpose of dressing their victuals. Thus, this animal alone seems to comprise within itself a variety of qualities, any one of which serves to render other quadrupeds absolutely necessary for the welfare of man: like the elephant it is manageable and tame; like the horse, it gives the rider security; it carries greater burdens than the ox or the mule, and its milk is furnished in as great abundance as that of the cow; the flesh of the young ones is supposed to be as delicate as veal; their hair is more beautiful, and more in request than wool; while even of its very excrements no part is useless.

SUPPLEMENTARY NOTE.

The term dromedary properly applies to a very swift species of camel. The name καμηλος δρομας (fleet camel) was given by Strabo and Diodorus Siculus to a single race of the species, of great speed, now called by the Arabs *el heirie*. Obtaining the word dromedary from *dromas*, we have popularly, and even scientifically, applied it to the species. A dromedary is to a camel, what a racer is to a horse of burden. There are one-humped and two-humped dromedaries, and one-humped and two-humped camels. The lean and almost fleshless body of the camel is covered with hair, which is very short on the forepart of the muzzle: this becomes longer on the top of the head, and almost tufty on the neck and parts of the fore-legs, on the back, and particularly on the hump, which it covers all over. The tail is also thick with hair, which extends considerably beyond the vertebræ. The colour of the hair varies: it is either white, with a slight tint of rose colour, gray, bay, or dark brown, approaching to black. The hair falls off, and is renewed every year about the end of spring and the commencement of summer.

At Pisa, in Italy, camels have been reared for two centuries. Of these M. Santi has published an interesting memoir. He describes the peculiar excitation of the camel for about two months of the year—February and March. During this period these patient and gentle creatures, particularly the male, become restless and ferocious; will bite their keepers; and fight amongst themselves with their teeth and feet. The female camel goes with young between eleven and twelve months, at the end of which time she has one foal. There has been no example at Pisa of more than one being produced at a birth. The little one is at first unable to stand upon its legs; and, as the mother will not stoop so as to allow it to suck, it would perish with hunger if the keeper did not lift it up to receive the nourishment which nature has provided. This assistance is rendered to the helpless creature for five or six days, during which time it acquires strength to stand upon its legs. In a wild state, it is evident that the dam must stoop, or the young camel stand up to suck; if otherwise, the race could not be continued. During the winter, the working camels of Pisa are fed with hay, in large stables; but during the remainder of the year they are turned out to pasture with the rest, who remain without shelter during all seasons. The green and tender grass, which other cattle eat with so much avidity, is neglected by these camels; but they greedily devour the leaves of the oak, of the cork-oak, and of the alder, and feed with manifest delight on every hard and dry substance which they can find, such as the thorn, the thistle, and the broom. They drink only once a-day.

Of the mode of breaking and training the camel by the people of the East, we have no complete account. M. Santi supplies this information, with regard to those of Tuscany. At the age of four years, a camel which is intended for labour is broken in. The trainers first double up one of his fore-legs, which they tie fast with a cord; they then pull the cord, and thus usually compel the animal to fall upon his bent knee. If this does not succeed, they tie up both legs, and he falls upon both knees, and upon the callosity which is upon his breast. They often accompany this operation with a particular cry, and with a slight blow of a whip. At this cry and blow, with the addition of a sudden jerk downwards of his halter, the camel gradually learns to lie down upon his belly, with his legs doubled under him, at the command of his driver. The trainers then accustom him to a pack-saddle, and place on it a load, at first light, but increased by degrees, as the animal increases in docility; till at last, when he readily lies down at the voice of his driver, and as readily rises up with his load, his education is so far complete. The burthen of a full-grown camel of Pisa is sometimes four hundred kilogrammes (above 800 lbs.), but such a load, if we may judge by other accounts, is excessive. He is accustomed, in the same gradual manner to allow his driver to mount, and to obey all his orders, and even his motions, in the direction of his course. M. Santi says, that it is neither a tedious nor a difficult task thus to subdue an animal of a timid and gentle nature, without defence, and whose spirit has been broken by a long course of slavery. In the East, however, the camel is sometimes oppressed by the loads which are placed upon him, when he is kneeling before his driver, and he expresses his displeasure. M. Denon, who travelled in Egypt during the expedition of Napoleon, and published a splendid work illustrative of the manners and antiquities of the country, has given us a spirited sketch of a camel thus suffering and irritated. "He cries out," says M. Denon, "when he is either laden too heavy or laden unequally. This good animal complains only of injustice, and then it must be extreme for him to complain at all."

The camel has seven callosities, upon which he throws the weight of his body, both in kneeling down and rising up. These consist of one on the breast, two on each of the fore-legs, and one on each of the hind. He sleeps always with his knees bent under his body, and his breast upon the ground. Some naturalists have contended that these callosities are produced by the constant friction to which the parts are exposed upon which they grow, in the same way that a tight shoe will produce a corn. M. Santi saw these seven callosities upon a camel just born; and he is unwilling to believe that they are an hereditary effect of the labour to which the species has been subjected for many centuries. This is an opinion which these naturalists have adopted, and it has been echoed by historians: Gibbon says the camel bears marks of servitude. For the same reason, that he is born with it, M. Santi doubts the opinion that has also been expressed, that the hump on the back of the camel is an hereditary effect of constant pressure upon that part. We are only acquainted with the domesticated camel: for although M. Desmoulins, a distinguished French naturalist, asserts that the camel existed in a wild state in Arabia, in the time of Adrian (A. D. 117), and the natives of central Africa maintain that they are to be found wild in the mountains where Europeans have never penetrated, it is highly probable that these statements refer to individual camels wandering from the control of man. We know nothing distinctly of the camel, but as one of the most useful and important servants of the human race; and, therefore, we have no means of contrasting a wild with a domesticated species. But, in the absence of positive evidence to the contrary, it is more easy to believe that the original organization of the camel should have been adapted to the services to which it is destined, than that the services should have altered the organization. The callosities enable the animal to receive its load, (in the only position in which man could put on that load,) by preventing the fracture of its skin by the pressure, either when it rises up or kneels down; and the hump on the back is so far from being a callosity produced by friction, that it is a soft, fatty substance, which is gradually absorbed into the system when the animal is without food, and is renewed when he obtains pasturage,—an evident proof that it is one of the several admirable provisions which he possesses for his support in the desert. We could as readily believe that the wonderful mechanism of the camel's stomach, by which it is enabled to abstain from water for many days, is a result of its habits, instead of its powers of abstinence being a consequence of this construction,—as that its hump and its callosities are merely hereditary badges of its subjection to man; and yet this opinion, monstrous as it is, has been adopted by a distinguished naturalist.

The uses which the camel has served in the civilization of mankind, in those countries of the East where civilization first commenced, have been of such importance, that they would fairly enter into the scheme of a wise and beneficent Providence. Unless such an animal had existed in Asia, (a country intersected by immense arid plains, and impassable with burthens, except by a creature possessing at once great strength and an extraordinary capacity of enduring privation,) the intercourse of mankind would have been confined to small spots where abundance reigned; the commodities of one part of that immense region could not have been exchanged for those of another; commerce, the great moving principle in the extension of civilization, would have been unknown; and knowledge would have been limited to particular districts, and would there have been of the most stunted and feeble growth—in the same way that a native crab-stock produces sour and worthless fruit, till some slip from the tree of another climate is grafted upon it. Thus, instead of the learning of the Hindoos and the Egyptians being communicated from one region to the other,* and thence, spreading over Greece, becoming the imperishable possession of the human race,—and instead of the produce of the East being brought to the West, to induce that taste for comforts and luxuries which principally developes the human intellect,—that portion of mankind which was first civilized would probably at this day have been in the same state of ignorance as the Indians of South America, whose communications are cut off by sandy deserts and inaccessible mountains, and who thus believe that the affairs of their mission (a settlement of a few hundred natives under a priest) comprise every thing that can be of interest to any individual of the great family of man.—*Abridged from the Library of Entertaining Knowledge.*

CHAP. VI.

THE LLAMA.

As almost all the quadrupeds of America are smaller than the resembling ones of the ancient continent, so the llama, which may be considered as the camel of the new world, is every way less than that of the old. This animal, like that described in the former chapter, stands high upon its legs, has a long neck, a small head, and resembles the camel, not only in its natural mildness, but its aptitude for servitude, its moderation, and its patience. The Americans early found out its useful qualities, and availed themselves of its labours: like the camel, it serves to carry goods over places inaccessible to other beasts of burden; like that, it is obedient to its driver, and often dies under, but never resists, his cruelty.

Of these animals, some are white, others black, but they are mostly brown; its face resembles that of the camel, and its height is about equal to that of an ass. They are not found in the ancient continent, but entirely belong to the new; nor are they found spread over all America, but are found chiefly upon those mountains that stretch from New Spain to the Straits of Magellan. They inhabit the highest regions of the globe, and seem to require purer air than animals of a lower situation are found to enjoy. Peru seems to be the place where they are found in greatest plenty. In Mexico they are introduced rather as curiosities than beasts of burden; but in Potosi, and other provinces of Peru, they make the chief riches of the Indians and Spaniards who rear them: their flesh is excellent food; their hair, or rather wool, may be spun into beautiful clothing; and they are capable, in the most rugged and dangerous ways, of carrying burdens not exceeding a hundred weight, with the greatest safety. It is true, indeed, that they go but slowly, and seldom above fifteen miles a-day; their tread is heavy, but sure; they descend precipices, and find footing among the most craggy rocks, where even man can scarcely accompany them: they are, however, but feeble animals, and after four or five days' labour, they are obliged to repose for a day or two. They are chiefly used in carrying the riches of the mines of Potosi; and we are told that there are above three hundred thousand of these animals in actual employ.

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* See Frederic Schlegel's History of Literature.

This animal, as was said before, is above three feet high, and the neck is three feet long, the head is small and well-proportioned, the eyes large, the nose long, the lips thick, the upper divided, and the lower a little depending; like all those animals that feed upon grass, it wants the upper cutting teeth; the ears are four inches long, and move with great agility; the tail is but five inches long, it is small, straight, and a little turned up at the end; it is cloven-footed like the ox, but it has a kind of spear-like appendage behind, which assists it in moving over precipices and rugged ways; the wool on the back is short, but long on the sides and the belly; it resembles the camel in the formation of the genital parts in the male, so that it makes urine backwards; it couples also in the same manner, and though it finds much difficulty in the action, it is said to be much inclined to venery. A whole day is often passed before this necessary business can be completed, which is spent in growling, quarrelling, and spitting at each other; they seldom produce above one at a time, and their age never extends above ten or twelve years at farthest.

Though the llama is no way comparable to the camel, either for size, strength, or perseverance, yet the Americans find a substitute in it, with which they seem perfectly contented. It appears formed for that indolent race of masters which it is obliged to serve; it requires no care, nor no expense in the attending or providing for its sustenance; it is supplied with a warm covering, and therefore does not require to be housed; satisfied with vegetables and grass, it wants neither corn nor hay to subsist it; it is not less moderate in what it drinks, and exceeds even the camel in temperance. Indeed, of all other creatures, it seems to require water least, as it is supplied by nature with saliva in such large quantities, that it spits it out on every occasion: this saliva seems to be the only offensive weapon that the harmless creature has to testify its resentment. When overloaded or fatigued, and driven on by all the torturing acts of its keeper, it falls on its belly, and pours out against him a quantity of this fluid; which, though probably no way hurtful, the Indians are much afraid of. They say, that wherever it falls, it is of such an acrimonious nature that it will either burn the skin, or cause very dangerous eruptions.[1]

Such are these animals in their domestic state; but as they are found wild in very great numbers, they exhibit marks of great force and agility in their state of nature. The stag is scarcely more swift, or the goat or the shamoy a better climber. All its shapes are more delicate and strong; its colour is tawny, and its wool is but short; in their native forests they are gregarious animals, and are often seen in flocks of two or three hundred at a time. When they perceive a stranger, they regard him at first with astonishment, without marking any fear or surprise; but shortly, as if by common consent, they snuff up the air, somewhat like horses, and at once, by a common flight, take refuge on the tops of the mountains; they are fonder of the northern than the southern side of the Andes; they often climb above the snowy tracts of the mountain, and seem vigorous in proportion to the coldness of their situation. The natives hunt the wild llama for the sake of its fleece. If the dogs surprise one upon the plain, they are generally successful; but if once the llama obtains the rocky precipice of the mountain, the hunters are obliged to desist in their pursuit.

The llama seems to be the largest of the camel kind in America; there are others, which are called Guanacoes and Pacoes, that are smaller and weaker, but endued with the same nature, and formed pretty much in the same manner. They seem to bear the same proportions to each other that the horse does to the ass, and are employed with the same degree of subordination. The wool, however, of the paco seems to be the most valuable, and it is formed into stuffs not inferior to silk, either in price or beauty. The natural colour of the paco is that of a dried rose leaf; the manufacturers seldom give its wool any other dye, but form it into quilts and carpets, which exceed those from the Levant. This manufacture forms a very considerable branch of commerce in South America, and probably, too, might be extended to Europe, were the beauty and the durability of what is thus wrought up sufficiently known.

[1] The saliva of llamas, it is now well-ascertained, is perfectly harmless.—Ed.

Supplementary Note.

The llamas form a secondary group of camels, offering to the eye of the naturalist very small anatomical differences of construction from that of the camel, properly so called. The foot of the llama is not like that of the camel, covered with an elastic sole which joins the two toes. From the absence of this entire sole, the species of South America is enabled to climb the precipices of the Andes which are its native region, the toes having strong nails, each of which has a thick cushion or pad below. The llama also wants the second canine tooth in the lower jaw;—but this difference is not by some considered such as to require a separation of the genus—for deer, of various species, have the same deviation from the general type. Again, the absence of the hump in the llama species is not an anatomical difference which constitutes a character;—for as the skeleton of the Bactrian camel with two humps does not differ from that of the Arabian with one, so does the arrangement of the bones of the llama agree precisely with the conformation of the camel. The zebu is an ox although he has a hump. The ears of the llama are longer, and the tail shorter than those of the camel. The similarities which determine the genus to which the camels and the llamas belong are principally these:—1. Each species has very remarkable peculiarities connected with the economy of their reproduction in which they differ from all other animals. 2. The camel and the llama differ also from every other species of the class of ruminating animals in the want of horns, and in having two large incisive teeth, on each side of the upper jaw. 3. The stomachs of the camel and the llama are, in some degree, similarly constructed. Father Feuillee has described the stomach of the llama; and maintains that it has not only a large reservoir for carrying water, but that, like the stomach of the camel, it has the same machinery for allowing the separation of solid from liquid aliment. Sir Everard Home, however, describes this portion of the llama's stomach as only partially resembling that of the camel. He says, "The stomach has a portion of it, as it were, intended to resemble the reservoirs for water in the camel; but these have no depth, are only superficial cells, and have no muscular apparatus to close their mouths, and allow the solid food to pass into the fourth cavity, or truly digesting stomach, without going into these cells." But that the llama has an internal mechanism for retaining water or secreting a liquid substance is certain; for on the summits of the Andes they are far above any lakes; and it has been observed that in a state of domestication they never exhibit any desire to drink, whilst they can obtain green pasture. 4. The llama, according to Molina, has a conformation resembling the camel's hump, being provided with an excess of nutritive matter, which lies in a thick bed of fat under the skin, and is absorbed as a compensation for an occasional want of food. These remarkable similarities certainly warrant naturalists in classing the camel and the llama in the same genus, although they differ both in size and form. They are each evidently fitted by nature for the endurance of great hardships and privations; the one amidst the sands of the desert under a burning sun, the other on the wastes of some of the loftiest mountains in the world, with a region of perpetual snow above them. The slight variations in their conformation, such as that of the foot, are modifications of nature which fit them for their respective localities. A habitation amongst the rocks would be mechanically impossible for the camel; whilst the burning plains would be as little suited to the llama. But each is adapted to exist in a very arid and sterile region; and their habits are created by their peculiar organization.

The domestication of the llama, in his native regions, has doubtless had a considerable effect in producing those differences of colour for which the species is remarkable. These variations, and some other distinctions arising not only out of the length and fineness of the wool, but also from dissimilarities of form, have led to a considerable contrariety of opinion amongst naturalists, whether individuals of this family belong to different species, or are varieties of the same. The French naturalists seem generally to agree with Buffon, in dividing the group into three species—the llama, the alpaca, and the vigogna;* but others, adopting the description of Molina, add two other species—the guanaco and the hueco.

The llamas of South America furnish a beautiful example of the determination of the locality of a particular groupe of animals, according to the elevation of the surface, where they find their food. This selection is probably determined by the temperature. The llamas are stationed upon different stages of the Cordilleras; and are found, or disappear, throughout that enormous chain of mountains, as the summits are elevated or depressed. Thus they range considerably below the line of perpetual snow, from Chili to New Granada, without reaching the isthmus of Panama. The species is not found in Mexico; and this remarkable circumstance is to be ascribed to the fact that at the isthmus the Cordillera has a less elevation than is suited to their natures and wants. In the same way some of the Alpine animals of Europe, (such as the bouquetin,) which never descend into the plains, are found upon mountains at long intervals, although the line of their summits is interrupted. This locality is determined by elevation. The same fact is constantly observed with regard to plants.

The llama was found by the Spaniards at the period of their conquest of South America. It was the only beast of burden which the natives possessed. Its flesh was eaten by the Indians:—and its wool was woven into cloth.

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* This division by Buffon is found in the Supplement to his works. He had previously recognised only two species.

CHAP. VII.

THE NYL-GHAU.

This animal, the name of which is pronounced *nylgaw*, is a native of India, and has but lately been imported into Europe; it seems to be of a middle nature, between the cow and the deer, and carries the appearance of both in its form. In size it is as much smaller than the one as it is larger than the other; its body, horns, and tail, are not unlike those of a bull; and the head, neck, and legs, are very like those of a deer. The colour, in general, is ash or gray, from a mixture of black hairs and white; all along the ridge or edge of the neck, the hair is blacker, larger, and more erect, making a short, thin, and upright mane. Its horns are seven inches long; they are six inches round at the root; growing smaller by degrees, they terminate in a blunt point. The bluntness of these, together with the form of its head and neck, might incline us to suppose it was of the deer kind; but, as it never sheds its horns, it has a greater affinity to the cow.

From the disposition of that brought over to this country, which has been very accurately and minutely described by Dr. Hunter, their manners are harmless and gentle. Although in its native wildness it is said to be fierce and vicious, this seemed pleased with every kind of familiarity, and always licked the hand that stroked or gave it bread, and never once attempted to use its horns offensively; it seemed to have much dependence on its organs of smell, and snuffed keenly, and with noise, whenever any person came within sight; it did so likewise when any food or drink was brought to it; and was so easily offended with smells, or so cautious, that it would not taste the bread which was offered, when the hand happened to smell strong of turpentine. Its manner of fighting is very particular. It was observed at Lord Clive's, where two males were put into a little enclosure, that, while they were at a considerable distance from each other, they prepared for the attack, by falling upon their fore-knees, when they shuffled towards each other with a quick pace, keeping still upon their fore-knees; and when they were come within some yards, they made a spring, and darted against each other. The intrepidity and force with which they dart against any object, appeared by the strength with which one of them attempted to overturn a poor labourer, who unthinkingly stood on the outside of the pales of its enclosure. The nyl-ghau, with the quickness of lightning, darted against the woodwork with such violence, that he broke it to pieces, and broke off one of his horns close to the root, which occasioned the animal's death. At all the places in India where we have settlements, they are considered as rarities, and brought from the distant interior parts of the country. The Emperor sometimes kills them in such numbers as to distribute quarters of them to all his omrahs; which shows that they are internally wild and in plenty, and esteemed good and delicious food. The nyl-ghaus which have been brought to England, have been most, if not all of them, received from Surat or Bombay; and they seem to be less uncommon in that part of India than in Bengal; which gives room for a conjecture, that they may be indigenous perhaps in the province of Guzarat, one of the most western and most considerable of the Hindostan empire, lying to the northward of Surat, and stretching away to the Indian ocean.

SUPPLEMENTARY NOTE.

This quadruped is a species of antelope. The male nyl-ghau is superior in stature to the stag, as well as more robust in its proportions. His head is rather large; his muzzle long and narrow; his ears middle-sized, open, and terminating abruptly in an obtuse point; his neck long and thick; his shoulders surmounted by a slight hump; his hinder quarters much less elevated than his fore-parts; his legs thicker than those of most other antelopes; and his tail of considerable length, reaching below the joint of the leg, and ending in a tuft of long hairs. His eyes are full, black, and prominent; and his suborbital sinuses large and obvious. The form of his horns is conical and slightly curved, with the concavity directed inwards and the points turned forwards. They take their origin by a triangular base of considerable thickness, marked with two or three indistinctly elevated rings, but become perfectly round and smooth above, tapering rapidly into a rather obtuse point. Their length is from seven to eight inches; and their colour a uniform dull black, corresponding with that of the hoofs. On all the upper parts of the body the general colour is of a slaty gray, the bases of the hairs being for the most part white with an occasional tinge of brown, and their tips dusky black. A thin mane of long black and white hairs extends along the middle line of the neck and part of the back. The head, legs, and under parts of the body are of a much deeper shade than the upper, the general tint being grayish black with a slight mixture of brown. On the forehead a few darker lines pass obliquely above and between the eyes. The muzzle, lips, inside of the mouth, and tongue are dusky brown. Along the outer edges of the lips and on the fore-part of the chin, the hairs are pure white; two roundish spots of white also occur on either side of the face behind the angle of the mouth, and a third, less distinctly marked, above the inner angle of the eye. A narrow band of white passes along the centre of the throat, and terminates on the upper part of the neck in a broad patch. The legs are also most commonly marked by a transverse white band immediately above the hoofs in front, and by a second patch of the same opposite to the accessory hoofs on the inner side. Beneath the fore-part of the neck is a tuft of long pendulous black hairs; and those which terminate the tail are of the same colour. The under side of the latter, the long hairs by which it is fringed, and the adjacent parts, are nearly white. The female is much smaller than the male, and at the same time lighter and more slender in her proportions. She is entirely destitute of horns, has a less hump on the shoulders, and her hind quarters are more nearly on a level with her fore. Her general colour, as also that of the young male, is a pale reddish brown, marked with precisely the same spots and patches of white as appear upon the full-grown male.

The nyl-ghaus appear to be by no means generally spread over the peninsula of Hindostan, but to be confined to its north-western provinces and the countries situated between them and Persia. Bernier, who alone of all the older travellers mentions the animal by name, or in such a manner as to admit of its being recognised, introduces it incidentally as one of the beasts which were hunted by the Mogul emperor, Aurung-zebe, during his progress from Delhi to his summer retreat in Cashmere. It would seem from the numbers of which he speaks as being sometimes taken on those occasions, to be very abundant; but we have not, up to the present time, any particular account of its habits in a state of nature. In captivity it is gentle and familiar, licking the hands of those who offer it bread, and suffering itself to be played with, not only without shyness, but with evident pleasure. There are, however, seasons in which it becomes capricious in its temper. When meditating an attack it falls suddenly upon its fore-knees, shuffles onwards in that posture until it has advanced to within a few paces of the object of its irritation, and then darts forward with a powerful spring, and butts with its head in the most determined manner. Its walk is awkward in consequence of the comparative shortness of its hind-legs, and the width to which it extends them; but in running this defect is scarcely perceptible. Lord Clive's original specimens several times produced young; but we are not aware that the breed has been continued, or that the same success has attended their introduction in other quarters.

CHAP. VIII.

THE BEAR.

Of the bear there are three different kinds, the Brown bear of the Alps, the Black bear of North America, which is smaller, and the great Greenland or White bear.[1] These, though different in their forms, are no doubt of the same original, and owe their chief variations to food and climate. They have all the same habitudes, being equally carnivorous, treacherous, and cruel. It has been said, indeed, that the black bear of America rejects animal food; but of the contrary I am certain, as I have often seen the young ones, which are brought over to London, prefer flesh to every kind of vegetable aliment.

The Brown bear is properly an inhabitant of the temperate climates; the black finds subsistence in the northern regions of Europe and America; while the great white bear takes refuge in the most icy climates, and lives where scarcely any other animal can find subsistence.

The brown bear[2] is not only savage, but solitary; he takes refuge in the most unfrequented parts, and the most dangerous precipices of uninhabited mountains. It chooses its den in the most gloomy parts of the forest, in some cavern that has been hollowed by time, or in the hollow of some old enormous tree. There it retires alone, and passes some months of the winter without provisions, or without ever stirring abroad. However, this animal is not entirely deprived of sensation, like the bat or the dormouse, but seems rather to subsist upon the exuberance of its former flesh, and only feels the calls of appetite when the fat it had acquired in summer begins to be entirely wasted away. In this manner, when the bear retires to its den, to hide for the winter, it is extremely fat; but at the end of forty or fifty days, when it comes forth to seek for fresh nourishment, it seems to have slept all its flesh away. It is a common report, that during this time they live by sucking their paws, which is a vulgar error that scarcely requires confutation. These solitary animals couple in autumn, but the time of gestation with the female is still unknown:[3] the female takes great care to provide a proper retreat for her young; she secures them in the hollow of a rock, and provides a bed of hay in the warmest part of her den; she brings forth in winter, and the young ones begin to follow her in spring. The male and female by no means inhabit the same den; they have each their separate retreat, and seldom are seen together but upon the accesses of genial desire.

The voice of the bear is a kind of growl, interrupted with rage, which is often capriciously exerted; and though this animal seems gentle and placid to its master, when tamed, yet it is still to be distrusted, and managed with caution, as it is often treacherous and resentful without a cause.

This animal is capable of some degree of instruction. There are few but have seen it dance in awkward measures upon its hind-feet, to the voice or the instrument of its leader; and it must be confessed that the dancer is often found to be the best performer of the two. I am told that it is first taught to perform in this manner, by setting it upon hot plates of iron, and then playing to it while in this uneasy situation.

The bear, when come to maturity, can never be tamed; it then continues in its native fierceness, and though caged, still formidably impotent, at the approach of its keeper flies to meet him. But notwithstanding the fierceness of this animal, the natives of those countries where it is found, hunt it with great perseverance and alacrity. The least dangerous method of taking it is by intoxicating it, by throwing brandy upon honey, which it seems to be chiefly fond of, and seeks for it in the hollow of trees. In Canada, where the Black bears are very common, and where their dens are made in trees that are hollow towards the top, they are taken by setting fire to their retreats, which are often above thirty feet from the ground. The old one is generally seen first to issue from her den, and is shot by the hunters. The young ones as they descend are caught in a noose, and are either kept or killed for provision. Their paws are said to be a great delicacy, and their hams are well enough known at the tables of the luxurious here. Their fat also, which still preserves a certain degree of fluidity, is supposed to be an efficacious remedy in white or indolent tumours, though probably very little superior to hog's lard.

The White Greenland bear differs greatly, both in figure and dimensions, from those already described; and though it preserves in general the external form of its more southern kindred, yet it grows to above three times the size. The brown bear is seldom above six feet long; the white bear is often known from twelve to thirteen. The brown bear is made rather strong and sturdy like the mastiff; the Greenland bear, though covered with very long hair, and apparently bulky, is nevertheless more slender, both as to the head, neck, and body, and more inclining to the shape of the greyhound. In short, all the variations of its figure and its colour seem to proceed from the coldness of the climate where it resides, and the nature of the food it is supplied with.

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[1] The animals of this kind, including the racoon, wolverene, glutton, and badger, have six front teeth in each jaw; the two lateral ones of the lower jaw are longer than the rest, and lobed, and are likewise furnished with smaller or secondary teeth at their internal bases: the canine teeth are single; there are five or six grinders on each side: the first of which is placed close to the canine teeth: the tongue is smooth; the snout projecting; and the eyes are furnished with a nictitant or winking membrane. The soles of the feet are long, and extend to the heel; some use their fore-paws as hands, and they are all able, except the grizzly bear, to climb trees in search of prey, or to avoid an enemy.—Ed.

[2] Buffon.

[3] The bear is gravid 112 days.

The white bear seems the only animal, that, by being placed in the coldest climate, grows larger than those that live in the temperate zones. All other species of animated nature diminish as they approach the poles, and seem contracted in their size by the rigours of the ambient atmosphere; but the bear, being unmolested in these desolate climates, and meeting no animal but what it can easily conquer, finding also a sufficient supply of fishy provisions, grows to an enormous size; and as the lion is the tyrant of an African forest, so the bear remains undisputed master of the icy mountains in Spitzbergen and Greenland. When our mariners land upon those shores, in such parts as have not been frequented before, the white bears come down to view them with an awkward curiosity; they approach slowly, seeming undetermined whether to advance or retreat, and being naturally a timorous animal, they are only urged on by the conscious experience of their former victories; however, when they are shot at, or wounded, they endeavour to fly, or, finding that impracticable, they make a fierce and desperate resistance till they die. As they live upon fish and seals, their flesh is too strong for food, and the captors have nothing but the skin to reward them for the dangers incurred in the engagement.

The number of these animals that are found about the north pole, if we consider the scarcity there of all other terrestrial creatures, is very amazing. They are not only seen at land, but often on ice-floats, several leagues at sea. They are often transported in this manner to the very shores of Iceland, where they no sooner land, but all the natives are in arms to receive them. It often happens that when a Greenlander and his wife are paddling out at sea, by coming too near an ice-float, a white bear unexpectedly jumps into their boat, and if he does not overset it, sits calmly where he first came down, and, like a passenger, suffers himself to be rowed along. It is probable the poor little Greenlander is not very fond of his new guest; however, he makes a virtue of necessity, and hospitably rows him to shore.

As this animal lives chiefly upon fish, seals, and dead whales, it seldom removes far from the shore. When forced by hunger, it often ventures into the deep, swims after seals, and devours whatever it can seize; it is, however, but a bad swimmer, and is often hunted in this manner by boats till it is fatigued, and at last destroyed. It often happens that a battle ensues between a bear and a morse or a whale; but as the latter are more expert in their own element, they generally prove victorious. However, when the bear can find a young whale, it repays him for the danger he incurs of meeting with the parent.

Supplementary Note.

The black bear of America is distinguished from his fellows, and more especially from the brown bear of Europe, which he approaches most nearly in size and form, by few very striking external differences except the colour of his fur. His forehead has a slight elevation; his muzzle is elongated, and somewhat flattened above; and his hair, though long and straight, has less shagginess than that of most of the other species of the group. In colour it is of a uniform shining jet black, except on the muzzle, where it is short and fawn-coloured, becoming almost gray on the lips and sides of the mouth. This, however, it should be observed, is the character only of the full-grown animal: the young are first of a bright ash colour, which gradually changes to a deep brown, and finally fixes in the glossy black tint of mature age.

The habits and manners of the black bear resemble those of the brown almost as closely as his physical characters. In a state of nature he seeks the recesses of the forest, and passes his solitary life in wild and uncultivated deserts, far from the society of man, and avoiding even that of the animal creation. His usual food consists of the young shoots of vegetables, of their roots, which he digs up with his strong and arcuated claws, and of their fruits, which he obtains by means of the facility with which the same organs enable him to climb the loftiest trees. He possesses indeed the faculty of climbing in a most extraordinary degree, and frequently exercises it in the pursuit of honey, of which he is passionately fond. When all these resources fail him, he will attack the smaller quadrupeds, and sometimes even animals of considerable size; familiarity with danger diminishing his natural timidity, and the use of flesh begetting a taste for its continued enjoyment. He is also said, like the Polar bear, to have a peculiar fondness for fish, and is frequently met with on the borders of lakes and on the coast of the sea, to which he has resorted for the gratification of this appetite. Notwithstanding his apparent clumsiness, he swims with the greatest dexterity, the excessive quantity of fat with which he is loaded serving to buoy him up in the water; in this way he frequently crosses the broadest rivers, or even very considerable arms of the sea.

The entire continent of North America, or perhaps it might be more correct to say, that immense portion of its surface which still remains uncultivated and desolate, furnishes an abode to this species of bear, which is consequently as widely dispersed as any of his tribe. As his fur is of some value in commerce, although not so much sought after at the present day as it was formerly, his race has become an object of the cupidity of man, by whom they are frequently hunted for the sake of their skins. This chase is principally followed by the Indians, who are also attracted by the flavour of his flesh, of which, and especially of the fat, they partake with an avidity truly disgusting. Travellers, however, who have been reduced to the necessity of having recourse to this sort of food, speak of it as by no means despicable: the fat yields moreover a quantity of oil, which is often extremely serviceable. The Indians will sometimes attack these animals single-handed; and if they can manage to keep beyond the reach of their powerful grasp, which is almost irresistible, are sure of gaining the victory; as the bears, in the rampant posture which they always assume in self-defence, unconsciously expose their most vulnerable parts to the attack of the hunter. Snares are sometimes laid for them; but these are most frequently unsuccessful; that extreme caution, which is so strongly portrayed in their actions and demeanour, rendering them mistrustful of every thing. Nevertheless their gluttony will sometimes get the better of their prudence, and the bait of honey offers too tempting an allurement to be always resisted. At other times a whole tribe of Indians will assemble for the chase, and after having performed a variety of superstitious observances, beat the entire country for their game, drive a great number of them into a spot selected for the purpose, and deal forth upon them wholesale destruction. They will also trace them to their retreats in the season of their lethargy, which occupies several of the winter months, and during which the bears are incapable of offering any effectual resistance. In captivity the black bear is distinguished from the brown only by the less degree of docility and intelligence which he evinces: and the habits of the latter are so universally known that it would be useless to dwell upon them here.

The grizzly bear is a native also of the northern division of America, and more particularly of that extensive tract of country which constitutes the newly erected State of Missouri. The grizzly bear differs in many striking points, both of character and habits, from the black bear, as well as from every other animal of the very natural group of which he forms part. By his elongated, narrowed, and flattened muzzle, added to the slight elevation of his forehead, he is closely connected with the black bear of America, and as remarkably distinguished from the common brown bear of Europe, and from the white bear of the polar regions, which last, in size and general form, offers perhaps the nearest approximation to the present species. But his enormous magnitude, which may be stated as averaging twice the bulk of the black bear; the greatly increased size and power of his canine teeth; and, above all, the excessive length of his talons, on the fore-feet especially, afford characteristic differences so obvious and so essential, that it is difficult to conceive how they could have been so long overlooked by naturalists as well as travellers, who have all, until within little more than thirty years of the present time, passed him over without even a casual hint that he presented any claims to be considered as distinct from the common species of his country.

His hair, generally speaking, is longer, finer, and more abundant than that of the black bear, and varies in colour to an almost indefinite extent, passing through all the intermediate shades between a light gray and a black brown. The brown tinge is, however, the most common; and it is always more or less grizzled either by the intermixture of grayish hairs, or by the brown hairs being tipped with gray. The hair of the legs and feet is darker and coarser, and diminishes in length as it descends; on the muzzle it becomes remarkably pale, and is so much shortened as to give to the animal an appearance of baldness. His eyes are very small, and hardly at all prominent: and the line of the profile is consequently nearly straight. His tail is scarcely visible, being almost entirely concealed by the long hairs which surround it. Of the great size of his feet and talons, some judgment may be formed from the measurements given by Captain Lewis and Clarke, the first travellers by whom the grizzly bear was accurately described. These gentlemen inform us that the breadth of the fore-foot in one of the individuals observed by them exceeded nine inches, while the length of his hind-foot, exclusive of the talons, was eleven inches and three quarters, and its breadth seven inches. The claws of the fore-foot of another specimen measured more than six inches. The latter are considerably longer and less curved than those of the hind-feet, and do not narrow in a lateral direction as they approach their extremity, but diminish only from beneath: the point is consequently formed by the shelving of the inferior surface alone, their breadth remaining the same throughout the whole of their enormous length, and their power being proportionally increased; an admirable provision for enabling the animal to exercise to the fullest extent his propensity for digging up the ground, either in search of food or for other purposes. It appears, however, on the other hand, to unfit him for climbing trees, which he never attempts; and this remarkable circumstance in his habits affords a striking distinction between him and all the other bears, which are essentially climbers.

Of all the quadrupeds which inhabit the northern regions of the American continent, the grizzly bear is unquestionably the most formidable and the most dreaded. Superior to the rest of his tribe, not excepting even the polar species, in bulk, in power, in agility, and in the ferocity of his disposition, it is not to be wondered at that he should be regarded by the native Indians with an almost superstitious terror, and that some portion of this feeling should have been communicated even to the civilized travellers, who have occasionally met with him in the wild and desolate regions which are subject to his devastations. In the journals of some of these travellers we find recorded such astonishing instances of his strength, ferocity, and extraordinary tenacity of life, as would indeed amaze us, were we not aware how much the human mind is prone, under certain circumstances, to fall into exaggeration, in many cases most certainly unintentional. Making, however, all due allowances for the existence of this very natural feeling, we are bound to acknowledge that there are few animals who can compete with this terrible beast; and that to be made the object of his pursuit is an occurrence well calculated to alarm the stoutest heart, even when provided with the most certain and deadly weapons of human invention, guided by the most experienced eye, and directed by the steadiest hand.

M. Duvaucel enumerates three species of bears inhabiting India and the neighbouring islands. The first of these is the Ursus Labiatus, which was strangely mistaken on its first arrival in Europe, nearly forty years ago, for a sloth, and received from the naturalists of that day the name of Bradypus pentadactylus, or ursinus, the Five-fingered, or Ursine, Sloth; an appellation which has been productive of no little confusion in nomenclature, and is still frequently employed in menageries and exhibitions to distinguish the same animal, and sometimes even nearly related species. With the true sloths it has nothing in common; and the only circumstance which can at all account for the blunder, consists in the accidental deficiency of the incisor teeth in the animal first examined; a deficiency which, according to the strict principles of the artificial system then adopted, was alone sufficient to convert a bear into a sloth. The second is the Ursus Malayanus, the Malay bear, admirably illustrated, both with regard to character and habits, by the late lamented Sir Stamford Raffles in the thirteenth volume of the Linnæan Transactions. The third is the Thibet bear, which, according to his observations made on the living animal, is distinguished by the following characteristics. In size it is intermediate between the two other species which he describes. Its most remarkable distinction is derived from the thickness of its neck and the flatness of its head, its forehead forming almost a straight line with its muzzle. The latter is moderately thick and somewhat lengthened; and the ears are very large. The body is compact, and the limbs heavy; a conformation from which we might be led to infer great muscular strength, together with a capacity for climbing trees, and performing other feats of a similar description, were it not for the comparative weakness of the claws, which are scarcely more than half as long as those of the other Indian bears. Like the latter, its colour is invariably of a uniform glossy jet-black, except on the lower lip, which is white; as is also a patch occupying the front of the neck, and in shape like a Y, the two upper limbs of which pass in front of the shoulders, while the lower one occupies the middle line of the chest. The upper part of the muzzle is black, with a slight reddish tint on the sides; and the edges of the lips flesh-coloured. The hair, which is smooth on the muzzle, becomes shaggy on the back part of the head, from the base of the ears downwards, and adds considerably to the apparent volume of that part, but not quite to the same extent as in the Ursus labiatus, in old individuals of which it almost touches the ground

Another species connected with the above is the Bornean bear. The Bornean bear is perhaps somewhat shorter in his proportions than the rest of the group, and the great proportional breadth of his head extends also to the neck and body. The claws are very long, strongly arched, and very gradually attenuated to the point, which is transversely truncated and chiefly fitted for digging the earth; but probably also for enabling it to climb with great agility. The fur is short and glistening, somewhat rigid, but closely applied to the skin, and smooth to the touch. On the body, head, and extremities, the Bornean bear has the same pure, satured jet-black tint which is observed in the Malayan. The muzzle, including the region of the eyes, has a yellowish brown colour; and the anterior part of the neck is marked by a large broad patch of a more vivid and nearly orange tint, which is of an irregular quadrangular form, and deeply notched above. The difference in the form and colour of this patch constitutes the chief distinction between the present animal and Malayan species, in which latter it is crescent-shaped and white.

CHAP. IX.

THE BADGER.

The badger's legs are so short that its belly seems to touch the ground; this, however, is but a deceitful appearance, as it is caused by the length of the hair, which is very long all over the body, and makes it seem much more bulky than it really is. It is a solitary stupid animal, that finds refuge remote from man, and digs itself a deep hole with great assiduity. It seems to avoid the light, and seldom quits its retreat by day, only stealing out at night to find subsistence. It burrows in the ground very easily, its legs being short and strong, and its claws stiff and horny. As it continues to bury itself, it throws the earth behind it to a great distance, and thus forms to itself a winding hole, at the bottom of which it remains in safety. As the fox is not so expert at digging into the earth, it often takes possession of that which has been quitted by the badger; and, some say, forces it from its retreat, by laying its excrements at the mouth of the badger's hole.

This animal, however, is not long in making itself a new habitation, from which it seldom ventures far, as it flies but slowly, and can find safety only in the strength of its retreat. When it is surprised by the dogs at some distance from its hole it then combats with desperate resolution; it falls upon its back, defends itself on every side, and seldom dies unrevenged in the midst of its enemies.

The badger, like the fox, is a carnivorous animal, and nothing that has life can come amiss to it.[1] It sleeps the greatest part of its time, and thus, without being a voracious feeder, it still keeps fat, particularly in winter. They always keep their hole very clean; and when the female brings forth, she makes a comfortable warm bed of hay, at the bottom of her hole, for the reception of her young. She brings forth in summer, generally to the number of three or four, which she feeds, at first with her milk, and afterwards with such petty prey as she can surprise. She seizes the young rabbits in their warren, robs birds' nests, finds out where the wild bees have laid up their honey, and brings all to her expecting brood.

The young ones when taken are easily tamed, but the old still continue savage and incorrigible; the former, after a short time, play with the dogs, follow their master about the house, but seem of all other animals the most fond of the fire. They often approach it so closely, that they burn themselves in a dangerous manner. They are sometimes also subject to the mange; and have a gland under their tail which scents pretty strongly. The poor of some countries eat their flesh; which though fat is at best but rank and ill-tasted.[2]

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[1] The badger's principal food is roots, fruits, snails, and worms. It seems quite a mistake, their living on animal food.—Ed.

[2] The spotted badger is of a white colour, marked with reddish, yellow, and dusky spots. It inhabits Europe and the north of Asia, as far as the northern provinces of Persia and China, and in Japan. The white badger is said by Mr. Brisson to have been brought from New York; it has very small eyes, and very short legs, and is only one foot nine inches long, with a tail of nine inches. This variety or species, is supposed by Mr. Bewick to be the same animal with the land bear. The spotted variety is very rare, nor is it mentioned from what country it was brought. The American badger inhabits Labradore, and the country about Hudson's Bay, in North America. This animal has a strong resemblance to the common or European badgers, but is somewhat smaller, and the hair is longer, more soft and silky; the ears are short, and of a white colour, edged with black; the head is white, with a black line on each side running from the forehead close to the inner corner of the eye, down to the nose; the hair on the back is four or five inches long, bright brown for the under half, then bright yellow, above that black, and white at the tips: the legs are short, and of a dark brown colour; having five claws behind, and only four before, which are considerably longer and larger; but the want of the fifth claw on the fore-part, being described from a dried specimen, may have been owing to accident. Its tail is covered with long dirty yellow hairs, tipped with white, having the ends dusky; the throat, breast, and belly are white; the fore-feet have only four toes. It is uncertain whether this animal possesses the orifice under the tail. In each jaw there are six fore teeth, one tusk on each side of each, and four grinders on each side in both; in all thirty-two.—Ed.

CHAP. X.

THE TAPIR.

There seems to be a rude, but an inferior resemblance between many animals of the old and the new world. The cougar of America resembles the tiger in natural ferocity, though far inferior in its dimensions. The llama bears some affinity to the camel, but is far behind it in strength and utility. The tapir may be considered as the hippopotamus of the new continent, but degraded both as to its size and ferocity.

This animal bears some distant resemblance in its form to a mule. It has a long snout which it lengthens or contracts at pleasure. Its ears are small, long, and pendant. Its neck and tail are short, and its claws strong and firm, of which it has four upon each foot. Its skin is thick, and covered with brown hair; and the natives make shields of it, which cannot be pierced by an arrow.

This animal may, in some measure, be termed amphibious, as it chiefly resides in the water. It differs, however, from all others of this kind, in feeding entirely upon vegetables, and not making this element the place of its depredations. It feeds upon the pastures by the riverside, and, as it is very timorous, the instant it hears the least noise, it plunges into the stream. They are greatly sought after by the natives, as their flesh is considered a delicacy, and thought by some not inferior to beef.

Supplementary Note.

The tapir has ten fore-teeth in each jaw, and no tusks; the canine teeth are single in each jaw, and are bent inwards; there are five very broad grinders on each side in both jaws, with a vacancy between them and the cutting teeth. The fore-feet have each four hoofs, and the hind-feet three; but on the fore-feet is an additional false or supplementary hoof. It has a long extensible and flexible proboscis or snout.

The tapir inhabits the woods and rivers of the eastern coast of South America, from the isthmus of Darien to the river Amazon. The tapir sleeps during the day in the thickest and most covert places of the woods, adjacent to the banks of rivers and lakes, into which it plunges when disturbed, and swims or walks on the bottom in the same manner with the hippopotamus. It goes about during the night in quest of food, and feeds on grass, sugar-canes, fruits, and other vegetables. It is an animal of mild and gentle nature, and is very easily made tame, being sometimes kept in farm-yards, in Guinea, and fed along with the cattle; it is timorous, salacious, sluggish, and slow-footed, but swims remarkably well, and dives to the bottom of the water, where it walks as well as on dry land. When domesticated it becomes familiar; will take any thing that is offered, and will even rummage with its nose in people's pockets for meat. This is the largest of the animals that are peculiar to America, being about the size of a small cow and having some general resemblance to a hog; in the male the nose is elongated into a sort of proboscis or flexible trunk, which extends far below the lower jaw, and is capable of being contracted and extended at pleasure: the sides of the snout are furrowed lengthwise, and with this the animal is able to lay hold of any thing, and convey it to its mouth; the nose of the female is destitute of this elongation, and both jaws are of equal length, ending in a pointed snout. The ears are roundish and erect; the eyes are very small; the neck is thick, short, and has a kind of bristly mane, about an inch and a half long on its upper part, near the head: the body is thick and clumsy, and the back is somewhat arched; the legs are short and thick, with small black hollow hoofs; the tail is very short and naked; the skin is very tough, and is covered with a short dusky-coloured fur, which in young animals is spotted with white. The voice of this animal resembles a kind of hiss, or whistle, which is so easily imitated that in this manner it is frequently trepanned.

The general attitude of the tapir, when at rest, is sitting on its rump. It sleeps much by day, and when attacked by dogs, makes a vigorous resistance. It produces but one at a birth, of which it is very careful, leading it early to the water, to instruct it in swimming. It is gregarious, feeds by night on vegetables, and does not ruminate, as M. Bajou affirms.

Of this genus there is only one species, which is entirely confined to South America, and therefore was unknown to the ancients.

A female tapir was exhibited at several of the fairs of Holland and Germany, the keepers usually feeding it on rye-bread, a kind of gruel, and vegetables of different kinds. It was excessively fond of apples, and was able to smell them at a considerable distance. If any persons happened to have apples in their pockets, it would eagerly approach them, and thrusting in its proboscis would take them out with surprising facility. It ate of almost every thing that could be presented to it, whether vegetables, fish, or meat. Its favourite attitude was sitting on its rump like a dog; and it never exerted its voice unless it was either fatigued or irritated.

CHAP. XI.

THE RACOON.

The racoon, which some authors have called the Jamaica rat, is about the size of a small badger; its body is short and bulky; its fur is fine, long, and thick, blackish at the surface, and gray towards the bottom; the nose is rather shorter and more pointed than that of a fox; the eyes large and yellow; the teeth resembling those of a dog: the tail thick, but tapering towards a point regularly marked with rings of black, and at least as long as the body; the fore-feet are much shorter than the hinder, both armed with five sharp claws, with which, and his teeth, the animal makes a vigorous resistance. Like the squirrel, it makes use of its paws to hold its food while eating, but it differs from the monkey kind, which uses but one hand on those occasions, whereas the racoon and the squirrel use both; as wanting the thumb, their paws singly are unfit for grasping or holding. Though this animal be short and bulky, it is however very active; its pointed claws enable it to climb trees with great facility;

it runs on the trunk with the same swiftness that it moves upon the plain, and sports amongst the most extreme branches with great agility, security, and ease; it moves forward chiefly by bounding, and though it proceeds in an oblique direction, it has speed enough most frequently to escape its pursuers.

This animal is a native of the southern parts of America, nor have any travellers mentioned its being found in the ancient continent. But in the climates of which it is a native, it is found in noxious abundance, particularly in Jamaica, where it keeps in the mountains, and where it often descends to feed upon the plantations of sugar-cane. The planters of these climates consider these animals as one of their greatest miseries; they have contrived various methods of destroying them, yet still they propagate in such numbers that neither traps nor fire-arms can set them free; so that a swarm of these famished creatures are found to do more injury in a single night than the labours of a month can repair.

But though, when wild, they are thus troublesome, in a state of tameness no animal is more harmless or amusing; they are capable of being instructed in various little amusing tricks. The racoon is playful and cleanly, and is very easily supported; it eats of every thing that is given it, and, if left to itself, no cat can be a better provider; it examines every corner, eats of all flesh, either boiled or raw, eggs, fruits, or corn; insects themselves cannot escape it, and, if left at liberty in a garden, it will feed upon snails, worms, and beetles; but it has a particular fondness for sweets of every kind, and to be possessed of these in its wild state, it incurs every danger. Though it will eat its provisions dry, it will for choice dip them in water, if it happens to be in the way. It has one peculiarity which few others have been found to possess—it drinks as well by lapping like a dog as by sucking like the horse.

CHAP. XII.

THE COATIMONDI.

The first peculiarity with which this animal strikes the spectator is the extreme length of its snout, which, in some measure, resembles that of the hog, but elongated to a surprising degree; it bears some distant resemblance to the animal last described, except that the neck and the body are longer, the fur shorter, and the eyes smaller; but its principal distinction, as was said before, consists in the shape of its nose; the upper jaw being an inch longer than the lower, and the snout, which is moveable in every direction, turning up at the end.[1] Like the racoon, it sits upon the hinder legs with great ease, and, in this position, with both paws carries the food to its mouth.

This animal is very subject to eat its own tail, which is rather longer than its body: but this strange appetite is not peculiar to the coati alone; the mococo, and some of the monkey kinds, do the same, and seem to feel no pain in wounding a part of the body so remote from the centre of circulation.

It seems possessed of the same playful qualities, and indiscriminate appetites, with the animal described in the last chapter; if left at liberty in a state of tameness, it will pursue the poultry, and destroy every living thing that it has strength to conquer; though it is playful with its keeper, yet it seems obstinately bent against receiving any instruction, and neither threats nor caresses can induce it to practise any arts to which it is not naturally inclined. When it sleeps, it rolls itself up in a lump, and in that position often continues for fourteen or fifteen hours together.

CHAP. XIII.

THE ANT-BEAR.

There are many animals that live upon ants in Africa and America; the pangolin or scaly lizard of Guinea may be considered among this number; but there are a greater variety in America, which make those minute insects their only subsistence. Though they are of different figures and sizes, yet, in general, they go under one common name of the ant-bear; the peculiar length and slenderness of their snout, their singular appetites, and the manner of taking their prey, striking us too strongly to attend to the minute differences of their size or form.

They have been classed by Mr. Buffon into the larger Tamandua, the smaller Tamandua, and the Ant-eater. The longest of this kind is four feet long from the tip of the snout to the insertion of the tail; their legs are short, and armed with four strong claws; their tail is long and tufted, and the animal often throws it on its back like the squirrel. The second of this kind is not above eighteen inches long, the tail is without hair, and it sweeps the ground as the animal moves. The ant-eater, which is the third variety, is still smaller than either of the former, as it is not above seven inches from the tip of the snout to the insertion of the tail. The two former are of a brown dusky colour, but this of a beautiful reddish, mixed with yellow. Though they differ in figure, they all resemble each other in one peculiarity, which is the extreme slenderness of their snout, and the amazing length of their tongue.

The snout is produced in so disproportionate a manner, that the length of it makes near a fourth part of the whole figure. A horse has one of the longest heads of any animal we know, and yet the ant-bear has one above twice as long, in proportion to its body. The snout of this animal is almost round and cylindrical; it is extremely slender, and is scarcely thicker near the eyes than at its extremity. The mouth is very small, the nostrils are very close to each other, the eyes are little in proportion to the length of the nose, the neck is short, the tongue is extremely long, slender, and flatted on both sides; this it keeps generally doubled up in the mouth, and is the only instrument by which it finds subsistence; for the whole of this tribe are entirely without teeth, and find safety only in the remoteness and security of their retreat.

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[1] The coatimondi is one of the weasel tribe, and is now known by the name of the Brazilian weasel. —Ed.

If we examine through the various regions of the earth, we shall find that all the most active, sprightly, and useful quadrupeds have been gathered round man, and either served his pleasures, or still maintained their independence by their vigilance, their cunning, or their industry. It is in the remote solitudes that we are to look for the helpless, the deformed, and the monstrous births of nature. These wretched animals, being incapable of defending themselves either by their agility or their natural arms, fall a prey to every creature that attacks them: they, therefore, retire for safety into the darkest forests, or the most desert mountains, where none of the bolder or swifter animals choose to reside.

It may well be supposed that an animal so helpless as the ant-bear is, with legs too short to fit it for flight, and unprovided with teeth to give it power of resistance, is neither numerous nor often seen; its retreats are in the most barren and uncultivated parts of South America. It is a native only of the new continent, and entirely unknown to the old. It lives chiefly in the woods, and hides itself under the fallen leaves. It seldom ventures from its retreat, and the industry of an hour supplies it with sufficient food for several days together. Its manner of procuring its prey is one of the most singular in all natural history: as its name implies, it lives entirely upon ants and insects; these, in the countries where it is bred, are found in the greatest abundance, and often build themselves hills five or six feet high, where they live in community. When this animal approaches an ant-hill, it creeps slowly forward on its belly, taking every precaution to keep itself concealed till it comes within a proper distance of the place where it intends to make its banquet; there, lying closely along at its length, it thrusts forth its round red tongue, which is often two feet long, across the path of these busy insects, and there lets it lie motionless for several minutes together. The ants of that country, some of which are half an inch long, considering it as a piece of flesh accidentally thrown before them, come forth and swarm upon it in great numbers: but wherever they touch they stick; for this instrument is covered with a slimy fluid, which, like bird-lime, entangles every creature that lights upon it. When, therefore, the ant-bear has found a sufficient number for one morsel, it instantly draws in the tongue, and devours them all in a moment; after which it still continues in its position, practising the same arts until its hunger is entirely appeased; it then retires to its hiding-place once more, where it continues in indolent existence till again excited by the calls of hunger.

Such is the luxurious life of a creature that seems, of all others, the most helpless and deformed. It finds safety in its hiding-places from its enemies, and an ample supply in some neighbouring ant-hill for all its appetites. As it only tries to avoid its pursuers, it is seldom discovered by them; yet helpless as this animal is, when driven to an extremity, though without teeth, it will fight with its claws with great obstinacy. With these arms alone it has often been found to oppose the dog, and even the jaguar. It throws itself upon its back, fastens upon its enemy with all its claws, sticks with great strength and perseverance, and even after killing its invader, which is sometimes the case, does not quit its hold, but remains fastened upon it with vindictive desperation.[1]

CHAP. XIV.

THE SLOTH.

OF the Sloth there are two different kinds, distinguished from each other by their claws; the one, which in its native country is called the *unan*, having only two claws upon each foot, and being without a tail; the other, which is called the *ai*, having a tail, and three claws upon each foot. The unan has the snout longer, the ears more apparent, and the fur very different from the other. It differs also in the number of its ribs, this having forty-six, while the ai has but twenty-eight. These differences, however, which, though very apparent, have been but little regarded in the description of two animals which so strongly resemble each other in the general outlines of their figure, in their appetites, and their helpless formation.

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[1] Besides the animal here described, there are others of the same kind; the most remarkable of which are, the little Ant-eater, or Fourmiller, and the prickly Ant-eater of New Holland. The former is singular for its having only two toes on the fore-feet, armed with strong claws; and a tail which it is able to coil round the branches of trees, and hold fast by. The claws on the fore-feet are extremely disproportionate; the outer one being very large, and the inner one much smaller. The whole animal is clothed in a beautiful, soft, curled, pale yellow fur. It is a native of Guiana. The prickly Ant-eater is a short, roundish animal, with a long tubular mouth, and entirely covered over on the upper parts with strong sharp spines, resembling those of the porcupine. Its tail is very short, and entirely concealed in the spines. The head, legs, and under-parts of the body, are thickly covered with a dark-brown harsh hair. On its fore-feet are five strong claws, and four on the hinder. In its mode of life it resembles the rest of its tribe, being generally found in the midst of some large ant-hill. When disturbed, it burrows with great strength and despatch under ground, during which exertion its body is lengthened out in a surprising manner.—ED.

They are both, therefore, described under the common appellation of the sloth, and their habitudes well deserve our wonder and curiosity. Nature seems cramped and constrained in their formation; other animals are often indolent from choice, these are slow from necessity; the ai, from which I shall take my description, and from which the other differs only in the slight particulars above-mentioned, and in being rather more active, is of about the size of a badger. Its fur is coarse and staring, somewhat resembling dried grass; the tail very short, and scarce appearing; the mouth extending from ear to ear; the eye dull and heavy; the feet armed with three claws each, and made so short, and set on so awkwardly, that a few paces is often the journey of a week; but though the feet are short, they are still longer than its legs, and these proceed from the body in such an oblique direction, that the sole of the foot seldom touches the ground. When the animal, therefore, is compelled to make a step forward, it scrapes on the back of the nails along the surface, and wheeling the limbs circularly about, yet still touching the ground, it at length places its foot in a progressive position; the other three limbs are all brought about with the same difficulty; and thus it is seen to move, not above three feet in an hour. In fact, this poor creature seldom changes place but by constraint, and when impelled by the severest stings of hunger.

The sloth seems to be the meanest and most ill-formed of all those animals that chew the cud; it lives entirely upon vegetable food, on the leaves, the fruit, and the flowers of trees, and often even on the very bark, when nothing else is left on the tree for its subsistence. Like all other ruminant animals, it has four stomachs; and these requiring a large share of provision to supply them, it generally strips a tree of all its verdure in less than a fortnight. Still, however, it keeps aloft, unwilling to descend, while any thing remains that can serve it for food; it therefore falls to devouring the bark, and thus in a short time kills the tree upon which it found its support. Thus destitute of provisions above, and crawling slowly from branch to branch in hopes of finding something still left, it is at last obliged to encounter all the dangers that attend it below. Though it is formed by Nature for climbing a tree with great pain and difficulty, yet it is utterly unable to descend; it therefore is obliged to drop from the branches to the ground, and as it is incapable of exerting itself to break the violence of its descent, it drops like a shapeless heavy mass, and feels no small shock in the fall. There, after remaining some time torpid, it prepares for a journey to some neighbouring tree; but this of all migrations is the most tedious, dangerous, and painful; it often takes a week in crawling to a tree not fifty yards distant; it moves with imperceptible slowness, and often baits by the way. All motions seem to torture it, every step it takes it sets forth a most plaintive, melancholy cry, which, from some distant similitude to the human voice, excites a kind of disgust, mixed with pity. This plaintive sound seems its chief defence, few quadrupeds appear willing to interrupt its progress, either that the flesh is offensive, or that they are terrified at its cries. When at length they reach their destined tree, they mount it with much greater ease than when they moved upon the plain. They fall to with famished appetite, and, as before, destroy the very source that supplies them.

How far these may be considered as the unfinished productions of nature, I will not take upon me to determine; if we measure their happiness by our sensations, nothing, it is certain, can be more miserable; but it is probable, considered with regard to themselves, they may have some stores of comfort unknown to us, which may set them upon a level with some other inferior ranks of the creation; if a part of their life be exposed to pain and labour, it is compensated by a larger portion of plenty, indolence, and safety. In fact, they are formed very differently from all other quadrupeds, and, it is probable, they have different enjoyments. Like birds, they have but one common vent for the purposes of propagation, excrement, and urine. Like the tortoise, which they resemble in the slowness of their motion, they continue to live some time after their nobler parts are wounded, or even taken away. They bear the marks of all those homely-formed animals, that, like rude machines, are not easily discomposed.

Its note,[1] according to Kircher, is an ascending and descending hexachord, which it utters only by night; its look is so piteous as to move compassion; it is also accompanied with tears, that dissuade everybody from injuring so wretched a being. Its abstinence from food is remarkably powerful; one that had fastened itself by its feet to a pole, and was so suspended across two beams, remained forty days, without meat, drink, or sleep; the strength of its feet is so great, that whatsoever it seizes on cannot possibly be freed from its claws. A dog was let loose at the above-mentioned animal, taken from the pole; after some time the sloth laid hold of the dog with its feet, and held him four days, till he perished with hunger.

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[1] Pennant's Synopsis

SUPPLEMENTARY NOTE.

Mr. Waterton, in his 'Wanderings in South America,' has thrown a new and more agreeable light on the character of the sloth. We extract in full his very interesting account of this animal.

"Let us now turn our attention," says he, "to the sloth, whose native haunts have hitherto been so little known, and probably little looked into. Those who have written on this singular animal have remarked that he is in a perpetual state of pain, that he is proverbially slow in his movements, that he is a prisoner in space, and that as soon as he has consumed all the leaves of the tree upon which he had mounted, he rolls himself up in the form of a ball, and then falls to the ground. This is not the case. If the naturalists who have written the history of the sloth had gone into the wilds, in order to examine his haunts and economy, they would not have drawn the foregoing conclusions; they would have learned, that though all other quadrupeds may be described while resting upon the ground, the sloth is an exception to this rule, and that his history must be written while he is in the tree.

"This singular animal is destined by nature to be produced, to live, and to die in the trees; and to do justice to him, naturalists must examine him in this his upper element. He is a scarce and solitary animal, and, being good food, he is never allowed to escape. He inhabits remote and gloomy forests where snakes take up their abode, and where cruelly stinging ants and scorpions, and swamps, and innumerable thorny shrubs and bushes, obstruct the steps of civilized man. Were you to draw your own conclusions from the descriptions which have been given of the sloth, you would probably suspect, that no naturalist has actually gone into the wilds with the fixed determination to find him out and examine his haunts, and see whether nature has committed any blunder in the formation of this extraordinary creature, which appears to us so forlorn and miserable, so ill put together, and so totally unfit to enjoy the blessings which have been so bountifully given to the rest of animated nature; for, as it has formerly been remarked, he has no soles to his feet, and he is evidently ill at ease when he tries to move on the ground, and it is then that he looks up in your face with a countenance that says, 'Have pity on me, for I am in pain and sorrow.'

"It mostly happens that Indians and Negroes are the people who catch the sloth, and bring it to the white man: hence it may be conjectured that the erroneous accounts we have hitherto had of the sloth, have not been penned down with the slighest intention to mislead the reader, or give him an exaggerated history, but that these errors have naturally arisen by examining the sloth in those places where nature never intended that he should be exhibited. However, we are now in his own domain. Man but little frequents these thick and noble forests, which extend far and wide on every side of us. This, then, is the proper place to go in quest of the sloth. We will first take a near view of him. By obtaining a knowledge of his anatomy, we shall be enabled to account for his movements hereafter, when we see him in his proper haunts. His fore-legs, or, more correctly speaking, his arms, are apparently much too long, while his hind-legs are very short, and look as if they could be bent almost to the shape of a corkscrew. Both the fore and hind legs, by their form, and by the manner in which they are joined to the body, are quite incapacitated from acting in a perpendicular direction, or in supporting it on the earth, as the bodies of other quadrupeds are supported, by their legs. Hence, when you place him on the floor, his belly touches the ground. Now, granted that he supported himself on his legs, like other animals, nevertheless he would be in pain, for he has no soles to his feet, and his claws are very sharp, and long, and curved; so that, were his body supported by his feet, it would be by their extremities, just as your body would be were you to throw yourself on all fours, and try to support it on the ends of your toes and fingers—a trying position. Were the floor of glass, or of a polished surface, the sloth would actually be quite stationary; but as the ground is generally rough, with little protuberances upon it, such as stones, or roots of grass, &c.; this just suits the sloth, and he moves his fore-legs in all directions in order to find something to lay hold of; and when he has succeeded, he pulls himself forward, and is thus enabled to travel onwards, but at the same time in so tardy and awkward a manner, as to acquire him the name of sloth. Indeed his looks and his gestures evidently betray his uncomfortable situation; and as a sigh every now and then escapes him, we may be entitled to conclude that he is actually in pain.

"Some years ago I kept a sloth in my room for several months. I often took him out of the house, and placed him upon the ground, in order to have an opportunity of observing his motions. If the ground were rough, he would pull himself forwards, by means of his fore-legs, at a pretty good pace; and he invariably shaped his course towards the nearest tree. But if I put him upon a smooth and well-trodden part of the road, he appeared to be in trouble and distress: his favourite abode was the back of a chair; and after getting all his legs in a line upon the topmost part of it, he would hang there for hours together, and often, with a low and inward cry, would seem to invite me to take notice of him.

"The sloth, in its wild state, spends its whole life in the trees, and never leaves them but through force, or by accident. An all-ruling Providence has ordered man to tread on the surface of the earth, the eagle to soar in the expanse of the skies, and the monkey and squirrel to inhabit the trees: still these may change their relative situations without feeling much inconvenience: but the sloth is doomed to spend his whole life in the trees; and, what is more extraordinary, not *upon* the branches, like the squirrel and the monkey, but *under* them. He moves suspended from the branch, he rests suspended from it, and he sleeps suspended from it. To enable him to do this, he must have a very different formation from that of any other known quadruped. Hence, his seemingly bungled conformation is at once accounted for; and in lieu of the sloth leading a painful life, and entailing a melancholy and miserable existence on its progeny, it is but fair to surmise that it just enjoys life as much as any other animal, and that its extraordinary formation and singular habits are but further proofs to engage us to admire the wonderful works of Omnipotence.

"It must be observed, that the sloth does not hang head-downwards like the vampire. When asleep, he supports himself from a branch parallel to the earth. He first seizes the branch with one arm, and then with the other; and after that brings up both his legs, one by one, to the same branch; so that all four are in a line: he seems perfectly at rest in this position. Now, had he a tail, he would be at a loss to know what to do with it in this position: were he to draw it up within his legs, it would interfere with them; and were he to let it hang down, it would become the sport of the winds. Thus his deficiency of tail is a benefit to him; it is merely an apology for a tail, scarcely exceeding an inch and a half in length. I observed, when he was climbing, he never used his arms both together, but first one and then the other, and so on alternately. There is a singularity in his hair, different from that of all other animals, and, I believe, hitherto unnoticed by naturalists; his hair is thick and coarse at the extremity, and gradually tapers to the root, where it becomes fine as the finest spider's web. His fur has so much the hue of the moss which grows on the branches of the trees, that it is very difficult to make him out when he is at rest. The male of the three-toed sloth has a longitudinal bar of very fine black hair on his back, rather lower than the shoulder-blades; on each side of this black bar there is a space of yellow hair, equally fine; it has the appearance of being pressed into the body, and looks exactly as if it had been singed. If we examine the anatomy of his fore-legs, we shall immediately perceive by their firm and muscular texture, how very capable they are of supporting the pendant weight of his body, both in climbing and at rest; and instead of pronouncing them a bungled composition, as a celebrated naturalist has done, we shall consider them as remarkably well-calculated to perform their extraordinary functions.

"As the sloth is an inhabitant of forests within the tropics, where the trees touch each other in the greatest profusion, there seems to be no reason why he should confine himself to one tree alone for food, and entirely strip it of its leaves. During the many years I have ranged the forests, I have never seen a tree in such a state of nudity; indeed, I would hazard a conjecture, that, by the time the animal has finished the last of the old leaves, there would be a new crop on the part of the tree he had stripped first, ready for him to begin again, so quick is the process of vegetation in these countries. There is a saying amongst the Indians, that when the wind blows the sloth begins to travel. In calm weather he remains tranquil, probably not liking to cling to the brittle extremity of the branches, lest they should break with him in passing from one tree to another; but as soon as the wind rises, the branches of the neighbouring trees become interwoven, and then the sloth seizes hold of them, and pursues his journey in safety. There is seldom an entire day of calm in these forests. The trade-wind generally sets in about ten o'clock in the morning, and thus the sloth may set off after breakfast, and get a considerable way before dinner. He travels at a good round pace; and were you to see him pass from tree to tree, as I have done, you would never think of calling him a sloth. Thus, it would appear that the different histories we have of this quadruped are erroneous on two accounts: first, that the writers of them, deterred by difficulties and local annoyances, have not paid sufficient attention to him in his native haunts; and secondly, they have described him in a situation in which he was never intended by nature to cut a figure; I mean on the ground. The sloth is as much at a loss to proceed on his journey upon a smooth and level floor, as a man would be who had to walk a mile on stilts upon a line of feather-beds.

"One day, as we were crossing the Essequibo, I saw a large two-toed sloth on the ground upon the bank; how he got there nobody could tell: the Indian said he had never surprised a sloth in such a situation before: he would hardly have come there to drink, for both above and below the place, the branches of the trees touched the water, and afforded him an easy and safe access to it. Be this as it may, though the trees were not above twenty yards from him, he could not make his way through the sand in time enough to escape before we landed. As soon as we got up to him he threw himself upon his back, and defended himself in gallant style with his fore-legs. 'Come, poor fellow,' said I to him, 'if thou hast got into a hobble to-day, thou shalt not suffer for it: I'll take no advantage of thee in misfortune; the forest is large enough both for thee and me to rove in; go thy ways up above, and enjoy thyself in these endless wilds; it is more than probable thou wilt never have another interview with man. So fare-thee-well.' On saying this, I took up a long stick which was lying there, held it for him to hook on, and then conveyed him to a high and stately Mora. He ascended with wonderful rapidity, and in about a minute he was almost at the top of the tree. He now went off in a side direction, and caught hold of the branch of a neighbouring tree; he then proceeded towards the heart of the forest. I stood looking on, lost in amazement at his singular mode of progress. I followed him with my eye till the intervening branches closed in betwixt us; and then I lost sight for ever of the two-toed sloth. I was going to add, that I never saw a sloth take to his heels in such earnest; but the expression will not do, for the sloth has no heels.

"That which naturalists have advanced of his being so tenacious of life, is perfectly true. I saw the heart of one beat for half-an-hour after it was taken out of the body. The wourali poison seems to be the only thing that will kill it quickly. A poisoned arrow killed the sloth in about ten minutes.

"So much for this harmless, unoffending animal. He holds a conspicuous place in the catalogue of the animals of the new world. Though naturalists have made no mention of what follows, still it is not less true on that account. The sloth is the only quadruped known, which spends its whole life from the branch of a tree, suspended by his feet. I have paid uncommon attention to him in his native haunts. The monkey and squirrel will seize a branch with their fore-feet, and pull themselves up, and rest or run upon it; but the sloth, after seizing it, still remains suspended, and suspended moves along under the branch till he can lay hold of another. Whenever I have seen him in his native woods, whether at rest, or asleep, or on his travels, I have always observed that he was suspended from the branch of a tree. When his form and anatomy are attentively considered, it will appear evident that the sloth cannot be at ease in any situation, where his body is higher, or above his feet. We will now take our leave of him."

CHAP. XV.

THE JERBOA.

This animal as little resembles a quadruped, as that which has been described in a former chapter.[1] If we should suppose a bird divested of its

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[1] An animal somewhat resembling the jerboa, but which has not yet been classified by naturalists, is the chinchilla. Notwithstanding the extensive traffic carried on in the skins of this animal, little was correctly known regarding it until the publication, in 1830, of 'The Gardens and Menageries of the Zoological Society delineated,' from which volume we extract the following account of this useful creature, being the first which has appeared in the English language.

"The length of the body in our specimen is about nine inches, and that of the tail nearly five. Its proportions are close-set, and its limbs comparatively short, the posterior being considerably longer than the anterior. The fur is long, thick, close, woolly somewhat crisped and entangled together, grayish or ash-coloured above, and paler beneath. The form of the head resembles that of the rabbit; the eyes are full, large and black; and the ears broad, naked, feathers, and walking upon its legs, it might give us some idea of its figure. It has four feet indeed, but in running, or resting, it never makes use of any but the hinder. The number of legs, however, do not much contribute to any animal's speed; and the jerboa, though, properly speaking, furnished but with two, is one of the swiftest creatures in the world.

The jerboa is not above the size of a large rat, and its head is sloped somewhat in the manner of a rabbit; the teeth also are formed like those of the rat kind, there being two cutting teeth in each jaw; it has a very long tail, tufted at the end; the head, the back, and sides, are covered with long ash-coloured soft hair; the breast and belly are whitish; but what most deserves our attention in the formation of this little animal, are the legs; the fore-legs are not an inch long, with four claws and a thumb upon each, while the hinder legs are two inches and a quarter, and exactly resemble those of a bird, there being but three toes, the middlemost of which is longest.

The jerboa is found in Egypt, Barbary, Palestine, and the deserts between Bassorah and Aleppo: its hind-legs, as was said before, are only used in running, while the fore-paws, like those of a squirrel, grasp its food, and in some measure perform the office of hands. It is often seen by travellers as they pass along the deserts, crossing their way, and jumping six or eight feet at every bound, and going so swiftly that scarce any other quadruped is able to overtake them. They are a lively, harmless race of animals, living entirely upon vegetables, and burrowing like rabbits in the ground. Mr. Pennant tells us of two that were lately brought to London, that burrowed almost through the brick wall of the room where they were kept; they came out of their hole at night for food, and when caught were much fatter and sleeker than when confined to their burrows. A variety of this animal is found also in Siberia and Circassia, and is most probably common enough over all Asia. They are more expert diggers than even the rabbit itself; and when pursued for a long time, if they cannot escape by their swiftness, they try to make a hole instantly in the ground, in which they often bury themselves deep enough to find security before their pursuers come up. Their burrows, in some places, are so thick, as to be dangerous to travellers, the horses perpetually falling in them. It is a provident little animal, and lays up for the winter. It cuts grass in heaps of a foot square, which, when dried, it carries into its burrow, therewith to serve it for food, or to keep its young warm during the rigours of the winter.

But of all animals of this kind, that which was first discovered and described by Mr. Banks, is the most extraordinary. He calls it the *kangaroo;* and though from its general outline, and the most striking peculiarities of its figure, it greatly resembles the jerboa, yet it entirely differs, if we consider its size, or those minute distinctions which direct the makers of systems in assorting the general ranks of nature.[2]

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rounded at the tips, and nearly as long as the head. The moustaches are plentiful and very long, the longest being twice the length of the head, some of them black, and others white. Four short toes, with a distinct rudiment of a thumb, terminate the anterior feet; and the posterior are furnished with the same number, three of them long, the middle more produced than the two lateral ones, and the fourth, external to the others, very short, and placed far behind. On all these toes the claws are short, and nearly hidden by tufts of bristly hairs. The tail is about half the length of the body, of equal thickness throughout, and covered with long bushy hairs; it is usually kept turned up towards the back, but not reverted as in the squirrels. It feeds in a sitting posture, grasping its food and conveying it to its mouth by means of its fore-paws. In its temper it is generally mild and tractable, but it will not always suffer itself to be handled without resistance, and sometimes bites the hand which attempts to fondle it when not in a humour to be played with. Although a native of the alpine valleys of Chili, and consequently subjected in its own country to the effects of a low temperature of the atmosphere, against which its thick coat affords an admirable protection, it was thought necessary to keep it during the winter in a moderately warm room, and a piece of flannel was even introduced into its sleeping apartment for its greater comfort. But this indulgence was most pertinaciously rejected, and as often as the flannel was replaced, so often was it dragged by the little animal into the outer compartment of its cage, where it amused itself with pulling it about, rolling it up and shaking it with its feet and teeth. In other respects it exhibits but little playfulness, and gives few signs of activity; seldom disturbing its usual quietude by any sudden or extraordinary gambols, but occasionally displaying strong symptoms of alarm when startled by any unusual occurrence. It is, in fact, a remarkable tranquil and peaceable animal unless when its timidity gets the better of its gentleness.—ED.

[2] Buffon, whose only errors were those of genius clearly perceived that every continent, in its animal productions, presented the appearance of an especial creation; but he gave a universality to this proposition, of which it is not altogether susceptible. It is nevertheless true, even at the present day, within certain limits. A great number of the Asiatic animals are not found in Africa, and *vice versa*. The lemurs seem to exist only in Madagascar. America is peopled with a host of mammalia, exclusively peculiar to itself, and there are many more in Europe not to be found in the other quarters of the globe. The discovery of Australasia has given an additional support to this opinion of Buffon. The species of animals there discovered, have not only no affinity with those of the other continents, but in fact, belong for the most part to genera altogether different. Such are those mammalia which the natives of New Holland call kangaroo, and which offer to the observation of the naturalist, organic peculiarities perceivable in no other animal, with the exception of one single species. It is in this tribe that for the first time we view the singular phenomenon of an animal using its tail as a third hind-leg in standing upright and in walking. The species we are now upon has received the name of Gigantic, because when named, it was supposed to be the largest of all that are known. These singular animals were among

The largest of the jerboa kind which are to be found in the ancient continent, do not exceed the size of a rabbit. The kangaroo of New Holland, where it is only to be found, is often known to weigh above sixty pounds, and must consequently be as large as a sheep. Although the skin of that which was stuffed and brought home by Mr. Banks, was not much above the size of a hare, yet it was greatly superior to any of the jerboa kind that have been hitherto known, and very different in many particulars. The snout of the jerboa, as has been said, is short and round, that of the new-discovered animal long and slender; the teeth also entirely differ; for as the jerboa has but two cutting teeth in each jaw, making four in all, this animal, besides his cutting teeth, has four canine teeth also; but what makes a more striking peculiarity, is the formation of its lower jaw, which, as the ingenious discoverer supposes, is divided into two parts, which open and shut like a pair of scissars, and cut grass, probably this animal's principal food. The head, neck, and shoulders are very small in proportion to the other parts of the body; the tail is nearly as long as the body, thick near the rump, and tapering towards the end; the skin is covered with a short fur, excepting the head and ears, which bear a slight resemblance to those of the hare. We are not told, however, from the formation of its stomach, to what class of quadrupeds it belongs; from its eating grass, which it has been seen to do, one would be apt to rank it among the ruminating animals; but, from the canine teeth which it is found to have, we may on the other hand suppose it to bear some relation to the carnivorous. Upon the whole, however, it can be classed with none more properly, than with animals of the jerboa kind, as its hind-legs are so much longer than the fore; it moves also precisely in the same manner, taking great bounds of ten or twelve feet at a time, and thus sometimes escaping even the fleetest greyhound with which Mr. Banks pursued it. One of them that was killed proved to be good food; but a second, which weighed eighty-four pounds, and was not yet come to its full growth, was found to be much inferior.

With this last described and last discovered animal, I shall conclude the history of quadrupeds, which of all parts of natural knowledge seems to have been described the most accurately. As these, from their figure as well as their sagacity, bear the nearest resemblance to man, and from their uses or enmities are the most respectable parts of the inferior creation; so it was his interest, and his pleasure, to make himself acquainted with their history. It is probable therefore that time, which enlarges the sphere of our knowledge in other parts of learning, can add but very little to this. The addition of a new quadruped to the catalogue already known, is of no small consequence, and happens but seldom; for the number of all is so few, that wherever a new one is found, it becomes an object worthy our best attention. It may take refuge in its native deserts from our pursuits, but not from our curiosity.

But it is very different with the inferior ranks of the creation; the classes of birds, of fishes, and of insects, are all much more numerous, and more incompletely known. The quadruped is possessed of no arts of escaping, which we are not able to overcome; but the bird removes itself by its swiftness, the fishes find protection in their native element, and insects are secured in their minuteness, numbers, and variety. Of all these, therefore, we have but a very inadequate catalogue; and though the list be already very large, yet every hour is adding to its extent.

In fact, all knowledge is pleasant only as the object of it contributes to render man happy; and the services of quadrupeds being so very necessary to him in every situation, he is particularly interested in their history: without their aid, what a wretched and forlorn creature would he have been; the principal part of his food, his clothing, and his amusements, are derived wholly from them; and he may be considered as a great lord, sometimes cherishing his humble dependents, and sometimes terrifying the refractory, to contribute to his delight and convenience.

The horse and the ass, the elephant, the camel, the llama, and the rein-deer, contribute to ease his fatigues, and to give him that swiftness which he wants from nature. By their assistance, he changes place without labour; he attains health

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the first fruits which accrued to natural history from the discovery of New South Wales, a country which has since proved so fertile in new and remarkable forms both of the animal and vegetable creations. Their natural habits in a wild state are still, however, very imperfectly known. They appear to live in small herds, perhaps single families, which are said to submit to the guidance of the older males, and to inhabit in preference the neighbourhood of woods and thickets. They are, as might be inferred from the small size of their mouths and the peculiar character of their teeth, purely herbivorous, feeding chiefly upon grass and roots. Their flesh is eaten by the colonists, by whom it is said to be nutritious and savoury, an assertion which is confirmed by those who have partaken of it in England. In order to procure this they are frequently hunted in their native country; but the dogs who are employed in this service sometimes meet with dangerous wounds, not only from the blows of their powerful tail, which is their usual weapon of defence, but also from the claws of their hind-feet, with which they have been known to lacerate the bodies of their assailants in a shocking manner. But, unless when thus driven to make use of such powers of self-defence as they possess, they are perfectly harmless and even timid; and, when domesticated, are not in the least mischievous. In several collections in this country, they have become almost naturalized, and appear to be but little affected by the change of climate. When confined in a small enclosure, they uniformly make their path round its circuit, seldom crossing it or passing in any other direction except for the purpose of procuring their food. Their whole appearance, and especially their mode of progression, is singularly curious, and even to a certain extent ludicrous.—Ed.

without weariness; his pride is enlarged by the elegance of equipage, and other animals are pursued with a certainty of success. It were happy indeed for man, if, while converting these quadrupeds to his own benefit, he had not turned them to the destruction of his fellow-creatures; he has employed some of them for the purposes of war, and they have conformed to his noxious ambition with but too fatal an obedience.

The cow, the sheep, the deer, and all their varieties, are necessary to him, though in a different manner. Their flesh makes the principal luxuries of his table, and their wool or skins the chief ornament of his person. Even those nations that are forbid to touch any thing that has life, cannot wholly dispense with their assistance. The milk of these animals makes a principal part of the food of every country, and often repairs those constitutions that have been broken by disease or intemperance.

The dog, the cat, and the ferret, may be considered as having deserted from their fellow-quadrupeds, to list themselves under the conduct and protection of man. At his command they exert all their services against such animals as they are capable of destroying, and follow them into places where he himself wants abilities to pursue.

As there is thus a numerous tribe, that he has taken into protection, and that supplies his necessities and amusements, so there is a still more numerous one, that wages an equal combat against him, and thus calls forth his courage and his industry. Were it not for the lion, the tiger, the panther, the rhinoceros, and the bear, he would scarcely know his own powers, and the superiority of human art over brutal fierceness. These serve to excite, and put his nobler passions into motion. He attacks them in their retreat, faces them with resolution, and seldom fails of coming off with a victory. He thus becomes hardier and better in the struggle, and learns to know and to value his own superiority.

As the last-mentioned animals are called forth by his boldest efforts, so the numerous tribe of the smaller vermin kind excite his continual vigilance and caution; his various arts and powers have been nowhere more manifest, than in the extirpation of those that multiply with such prodigious fecundity. Neither their agility nor their minuteness can secure them from his pursuits; and though they may infest, they are seldom found materially to injure him.

In this manner we see, that not only human want is supplied, but that human wit is sharpened, by the humbler partners of man in the creation. By this we see, that not only their benefits but their depredations are useful, and that it has wisely pleased Providence to place us like victors in a subdued country, where we have all the benefit of conquest, without being so secure as to run into the sloth and excesses of a certain and undisturbed possession. It appears, therefore, that those writers who are continually finding immediate benefit in every production, see but half way into the general system of nature. Experience must every hour inform us, that all animals are not formed for our use; but we may be equally well assured, that those conveniences which we want from their friendship, are well repaid by that vigilance which we procure from their enmity.

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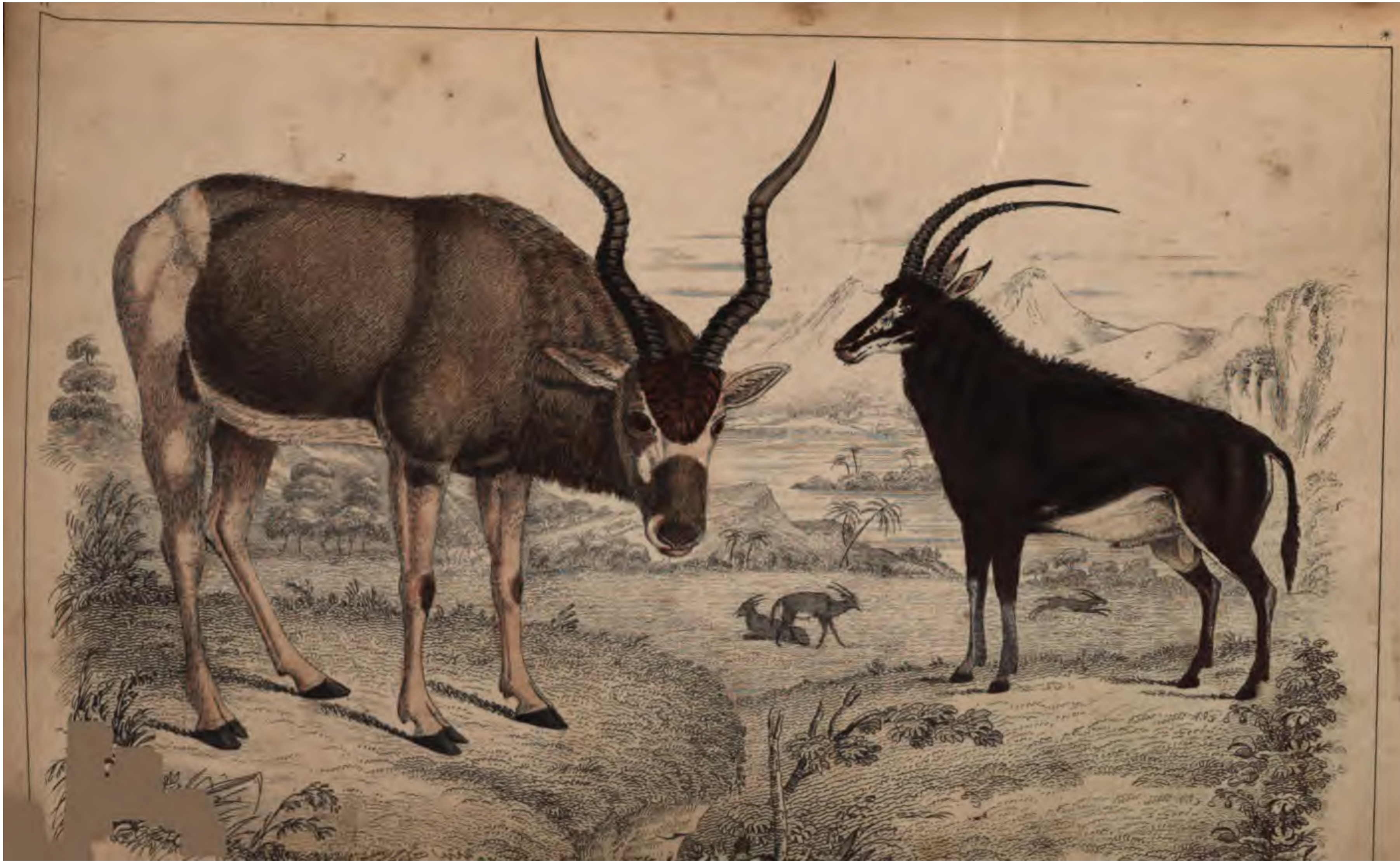

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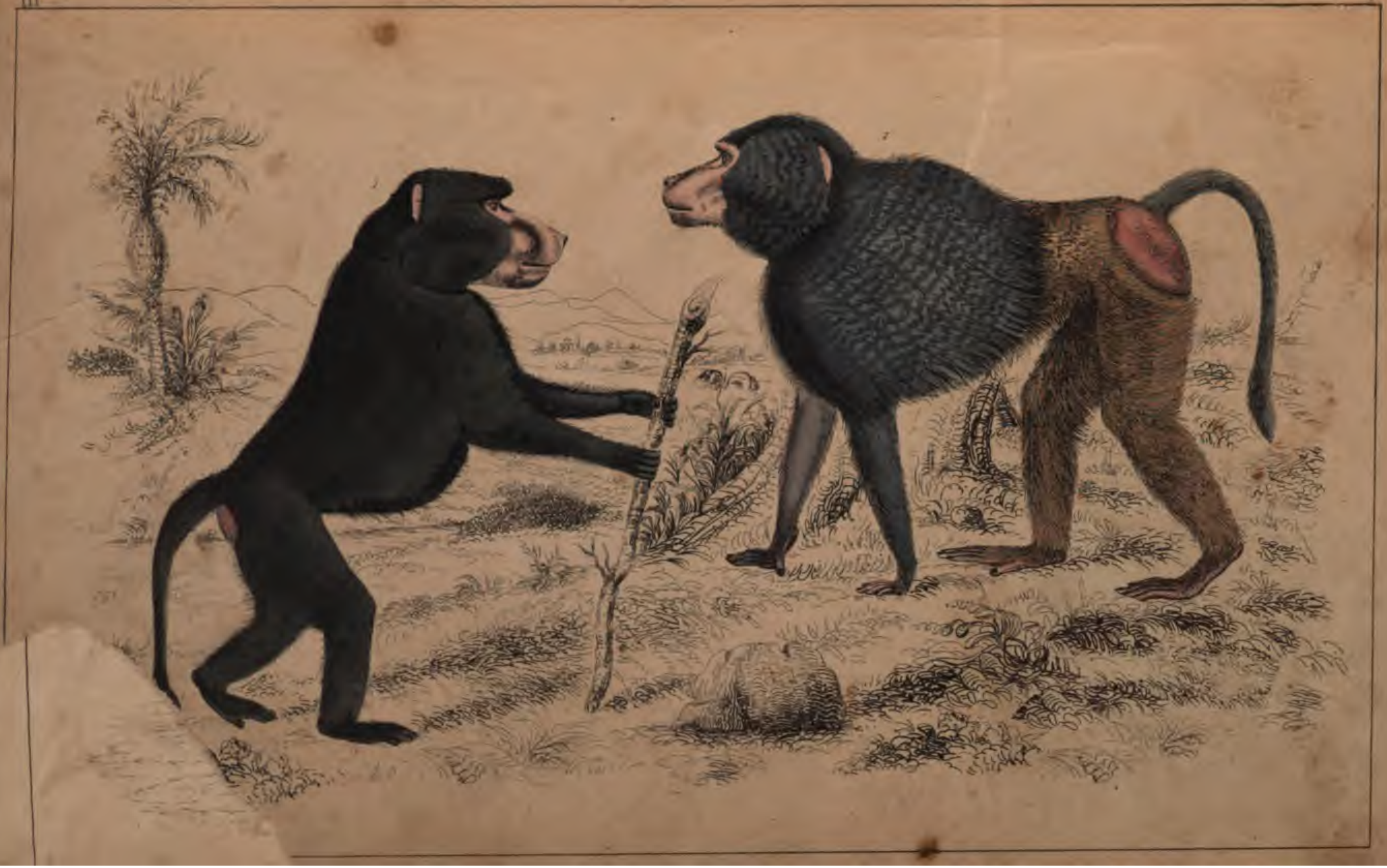

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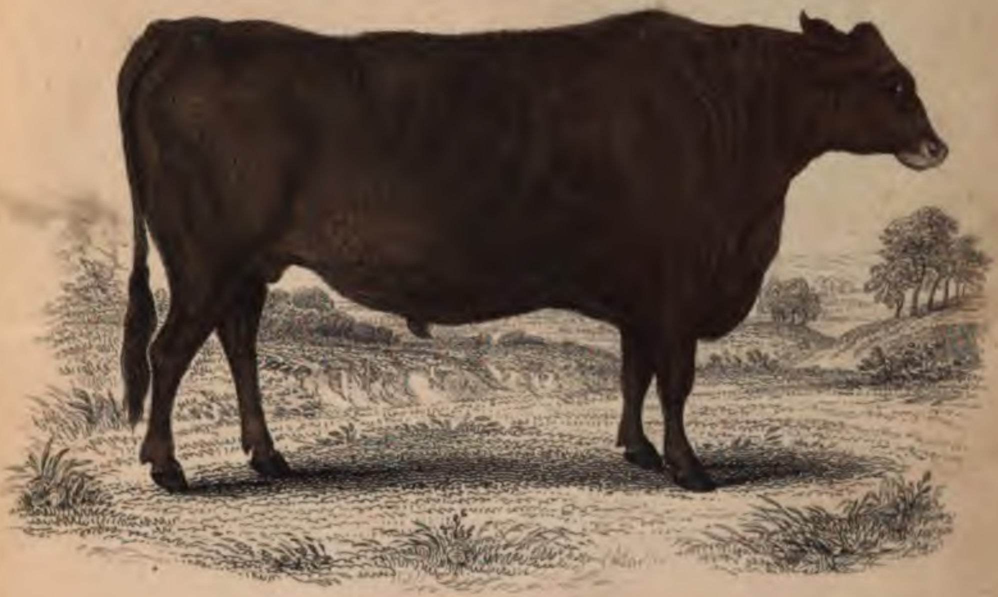

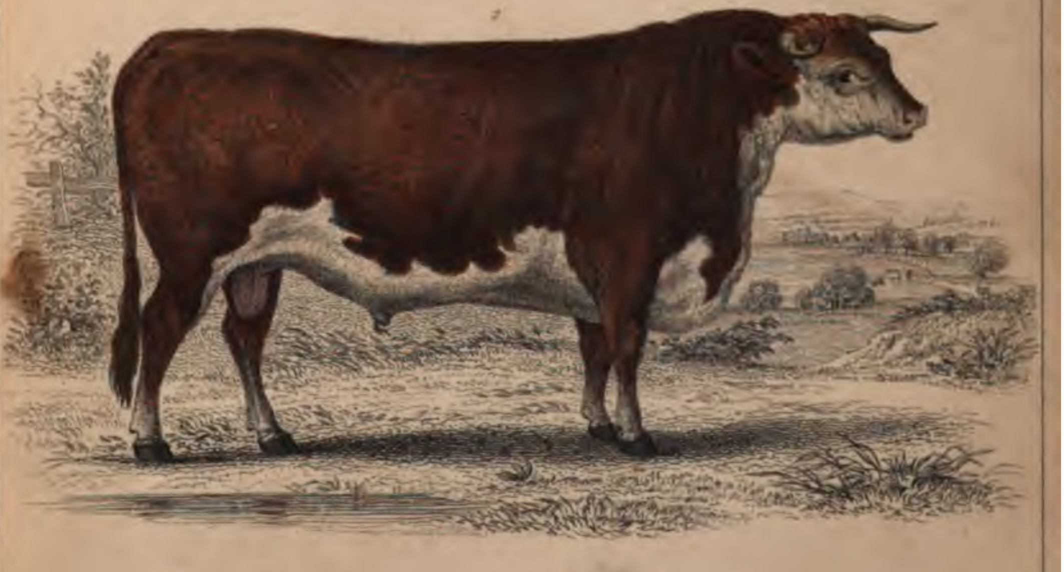

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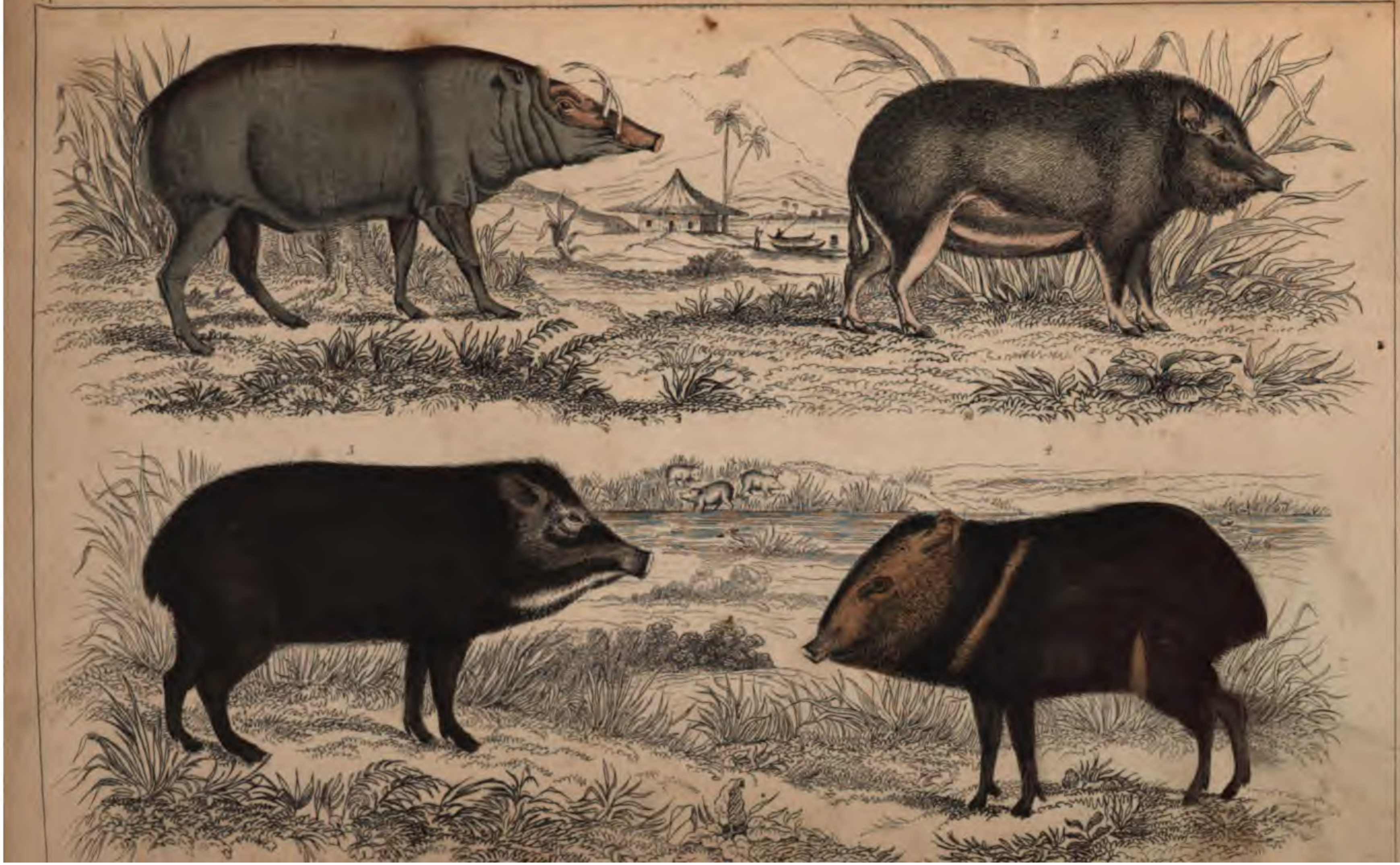

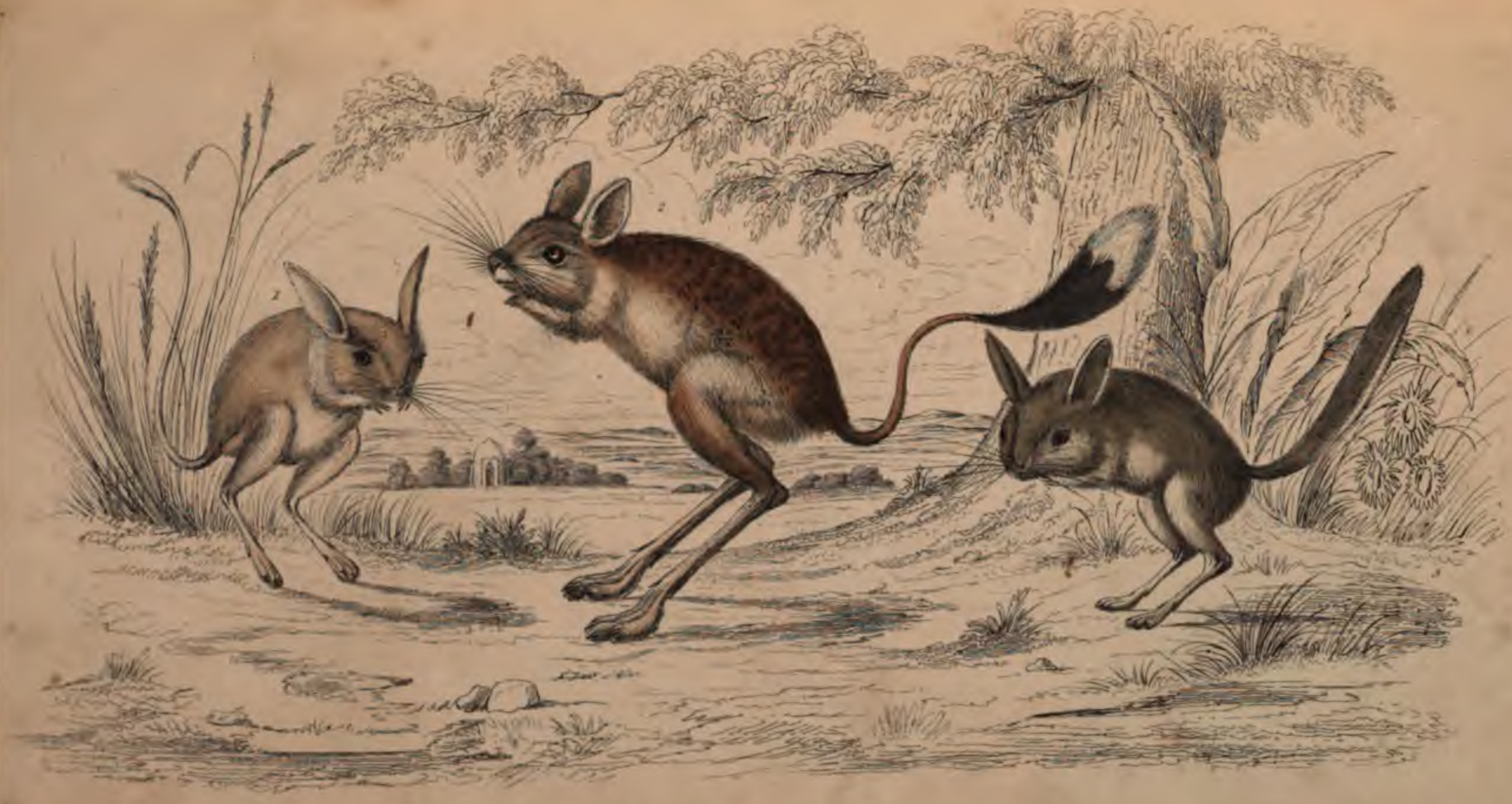

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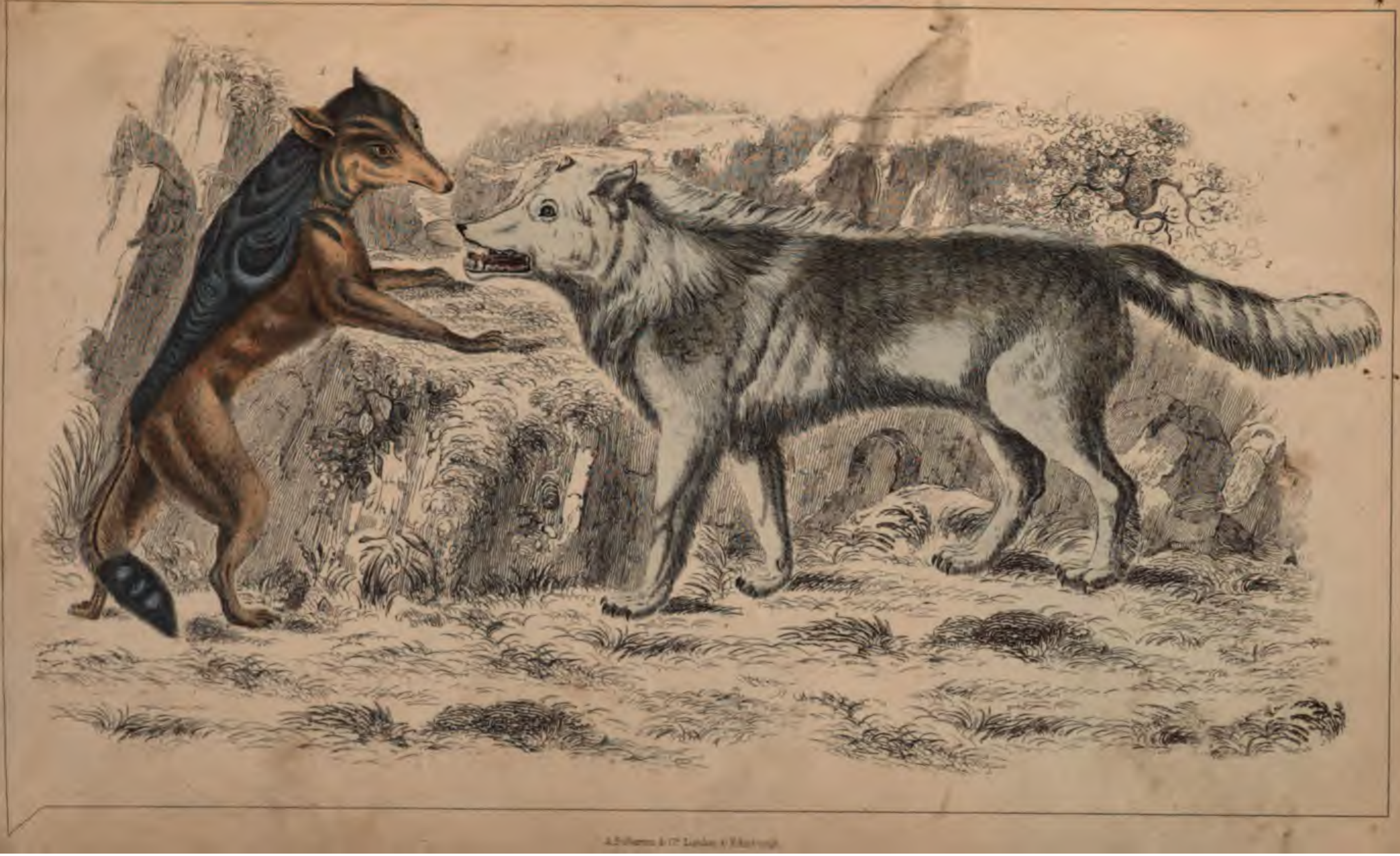

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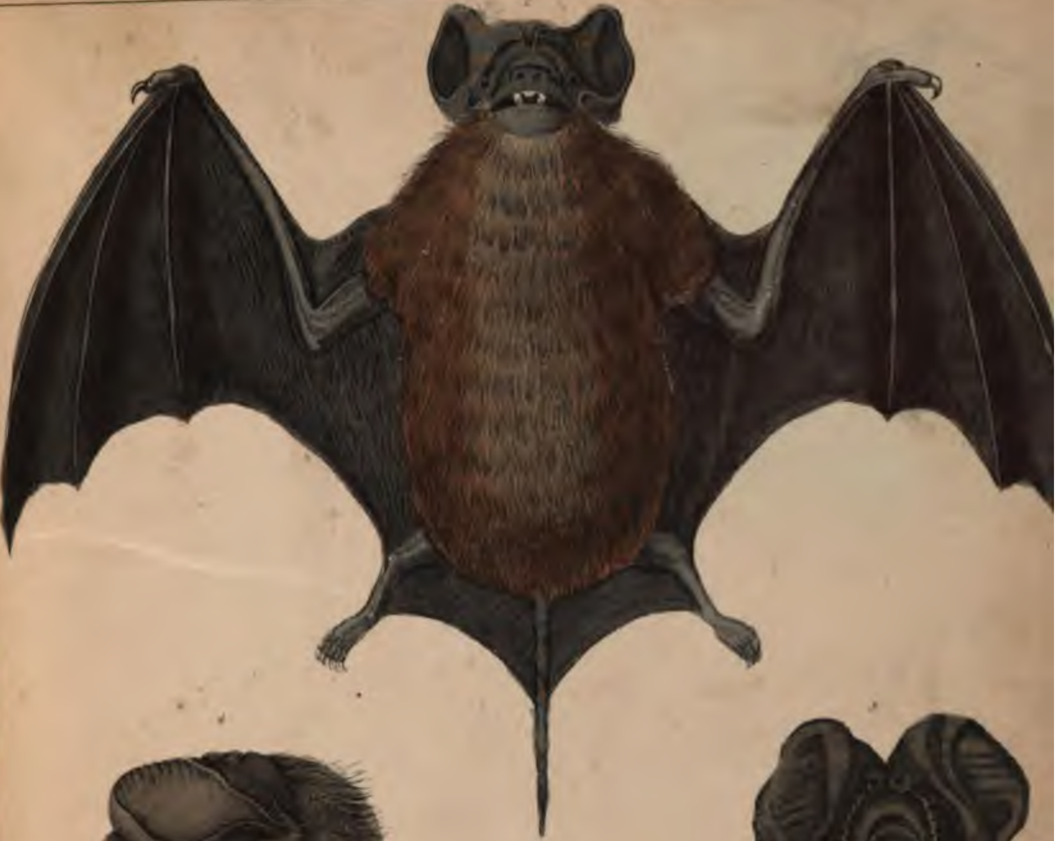

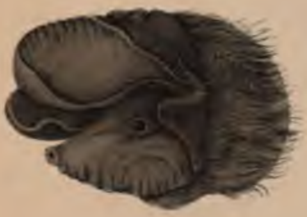

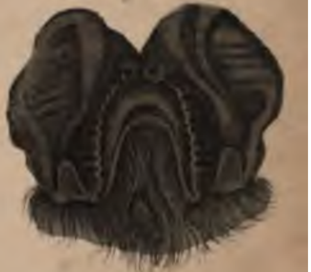

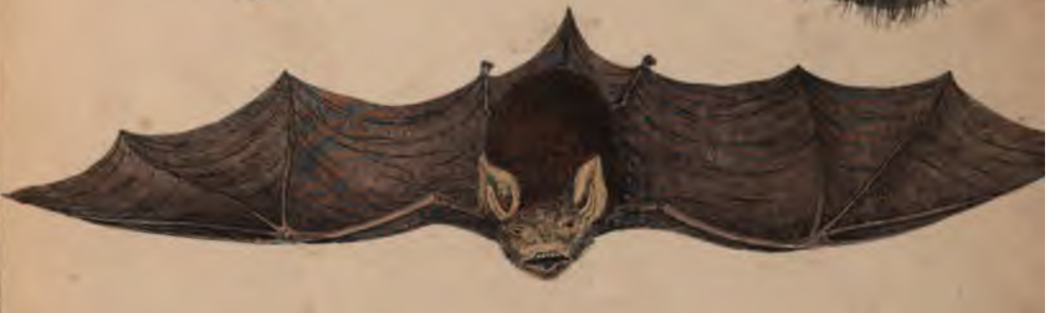

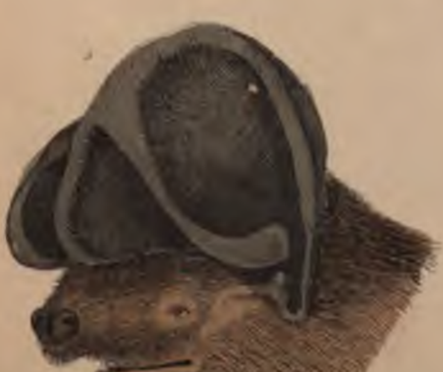

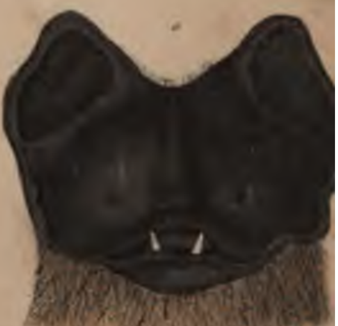

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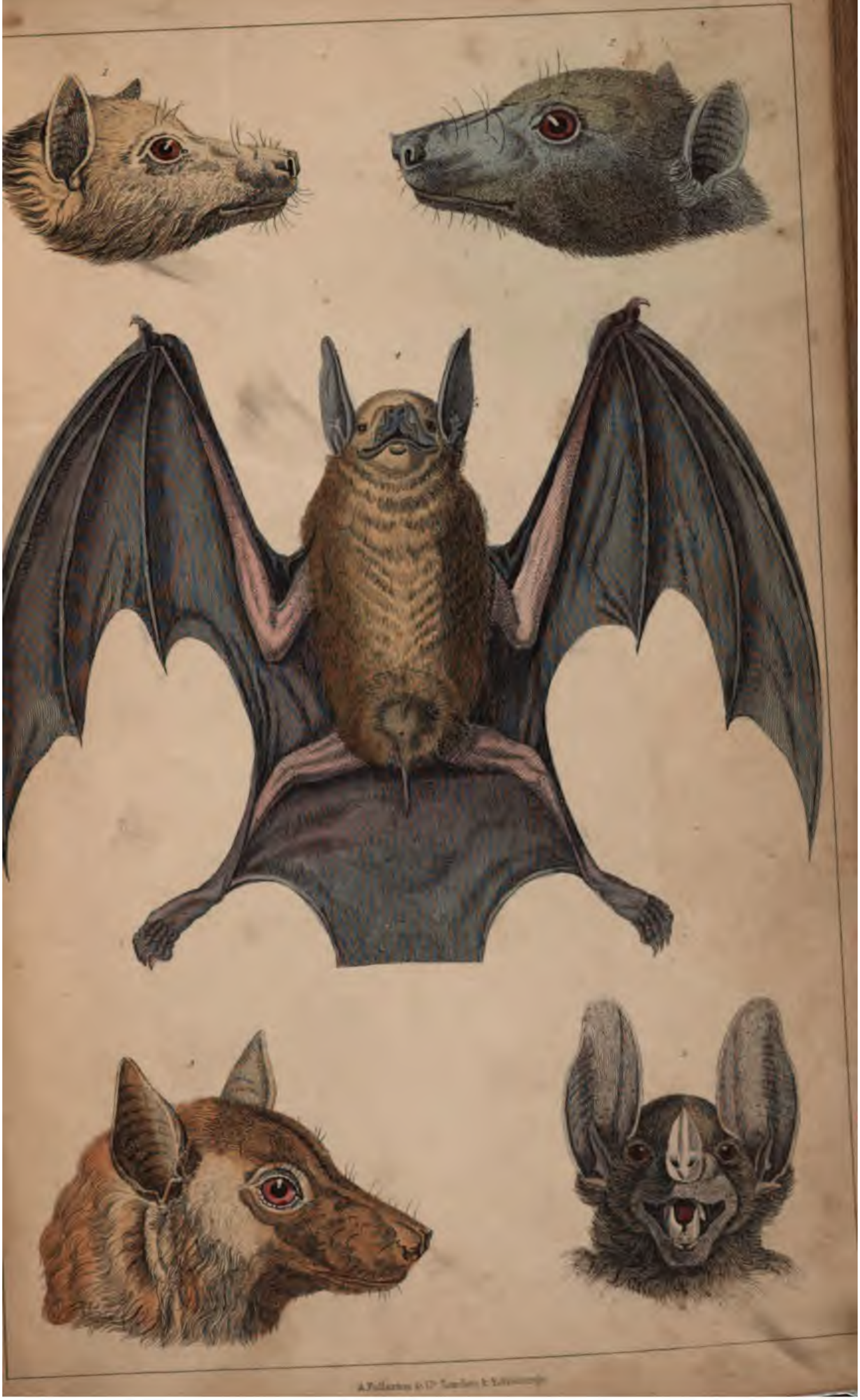

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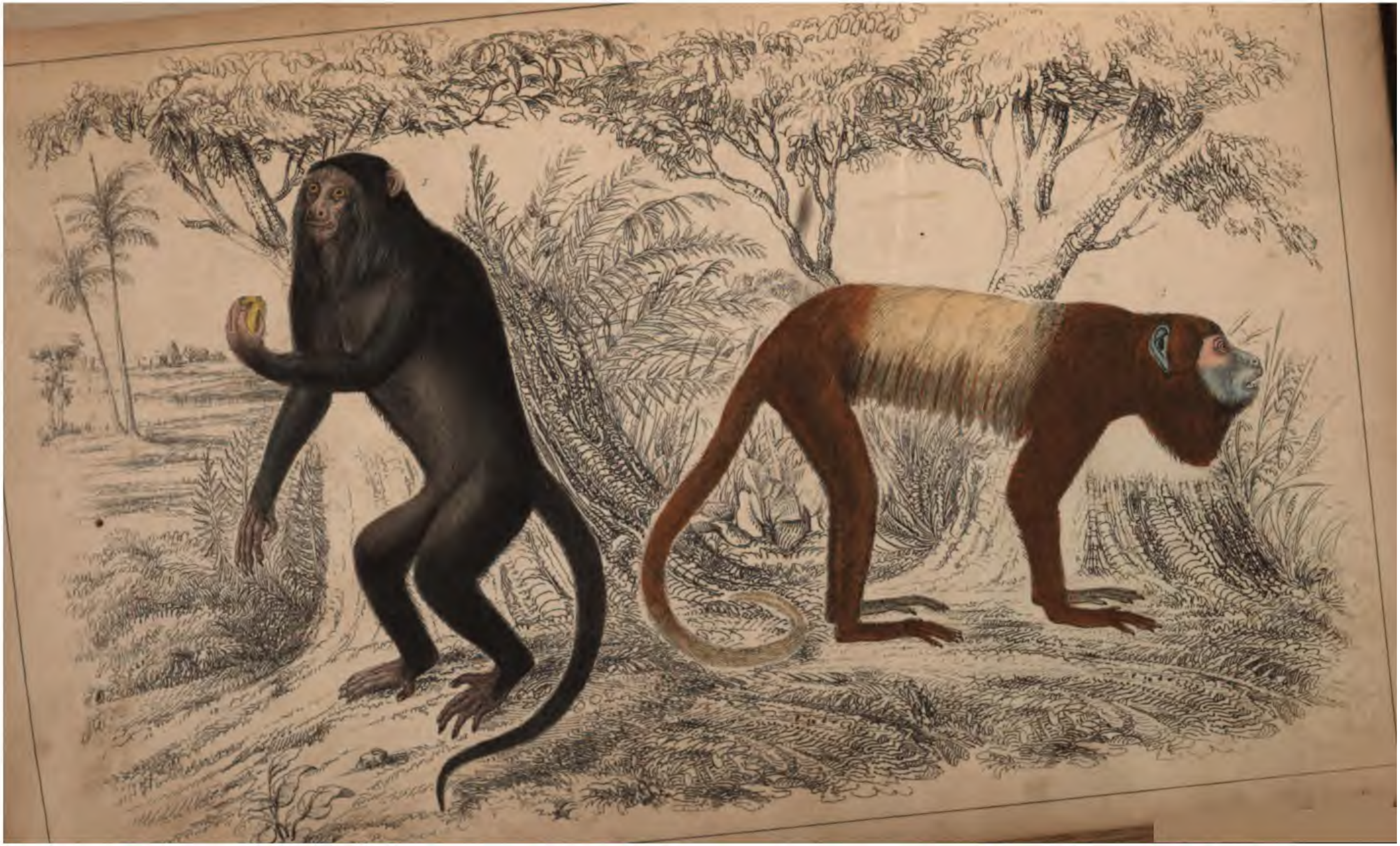
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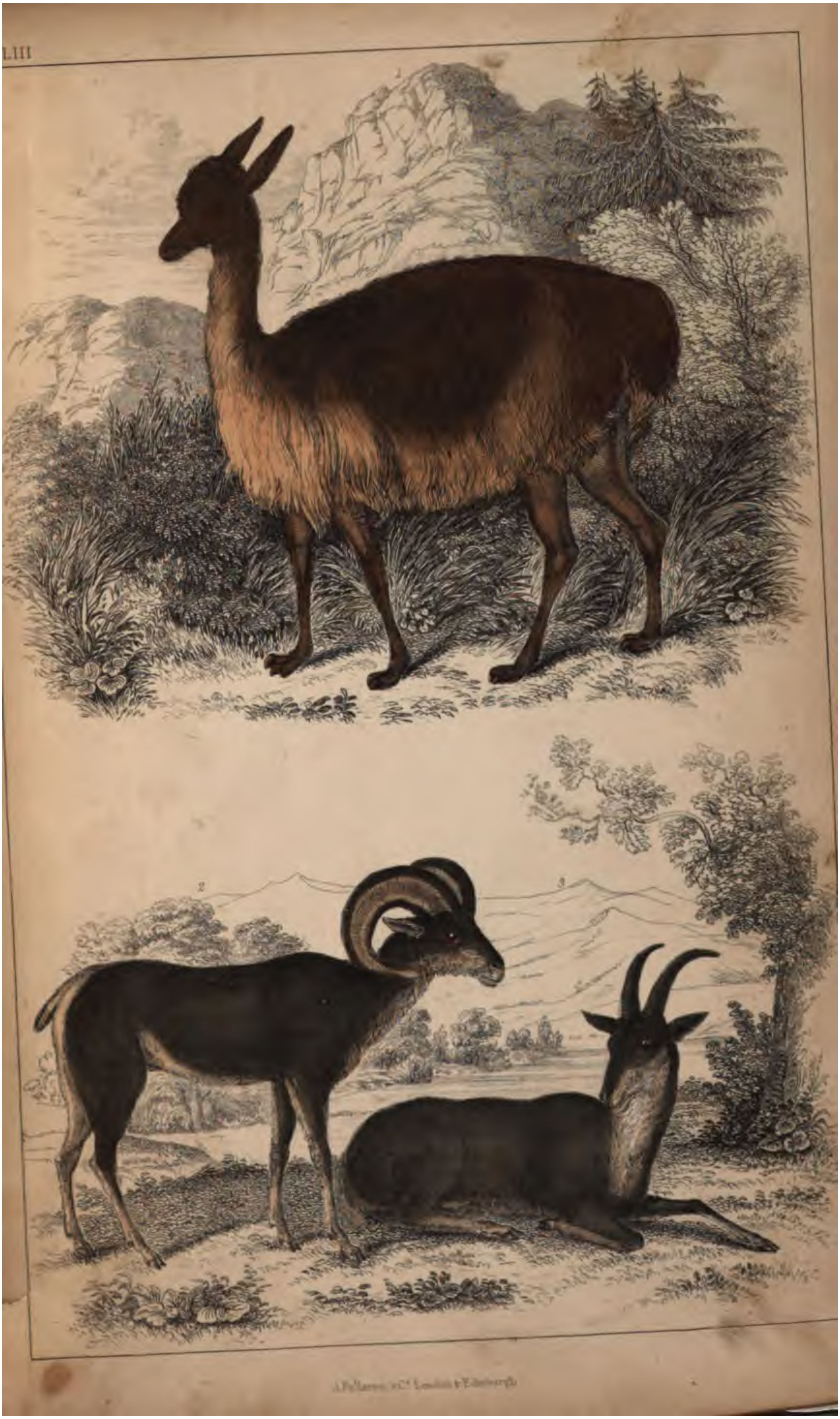

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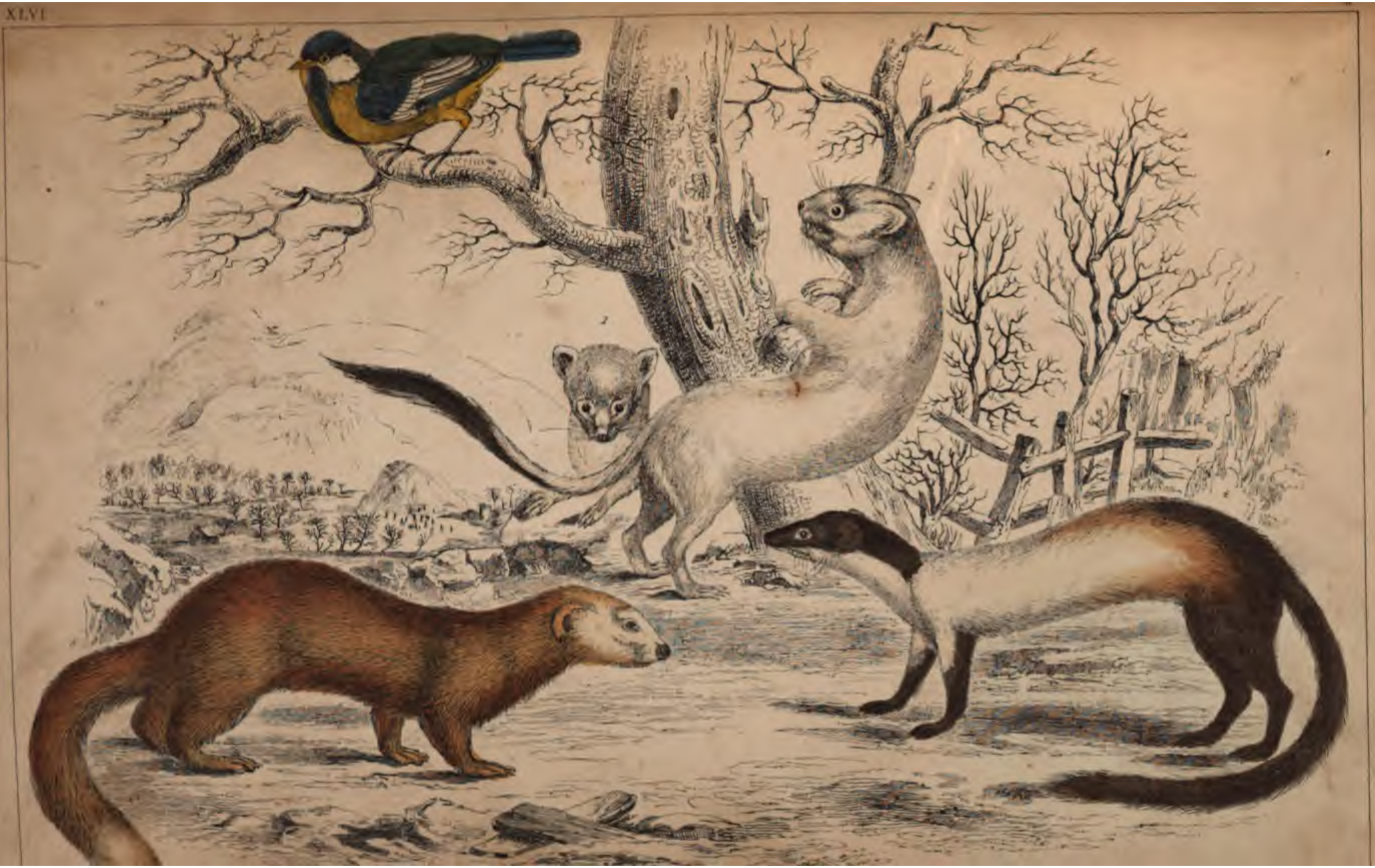
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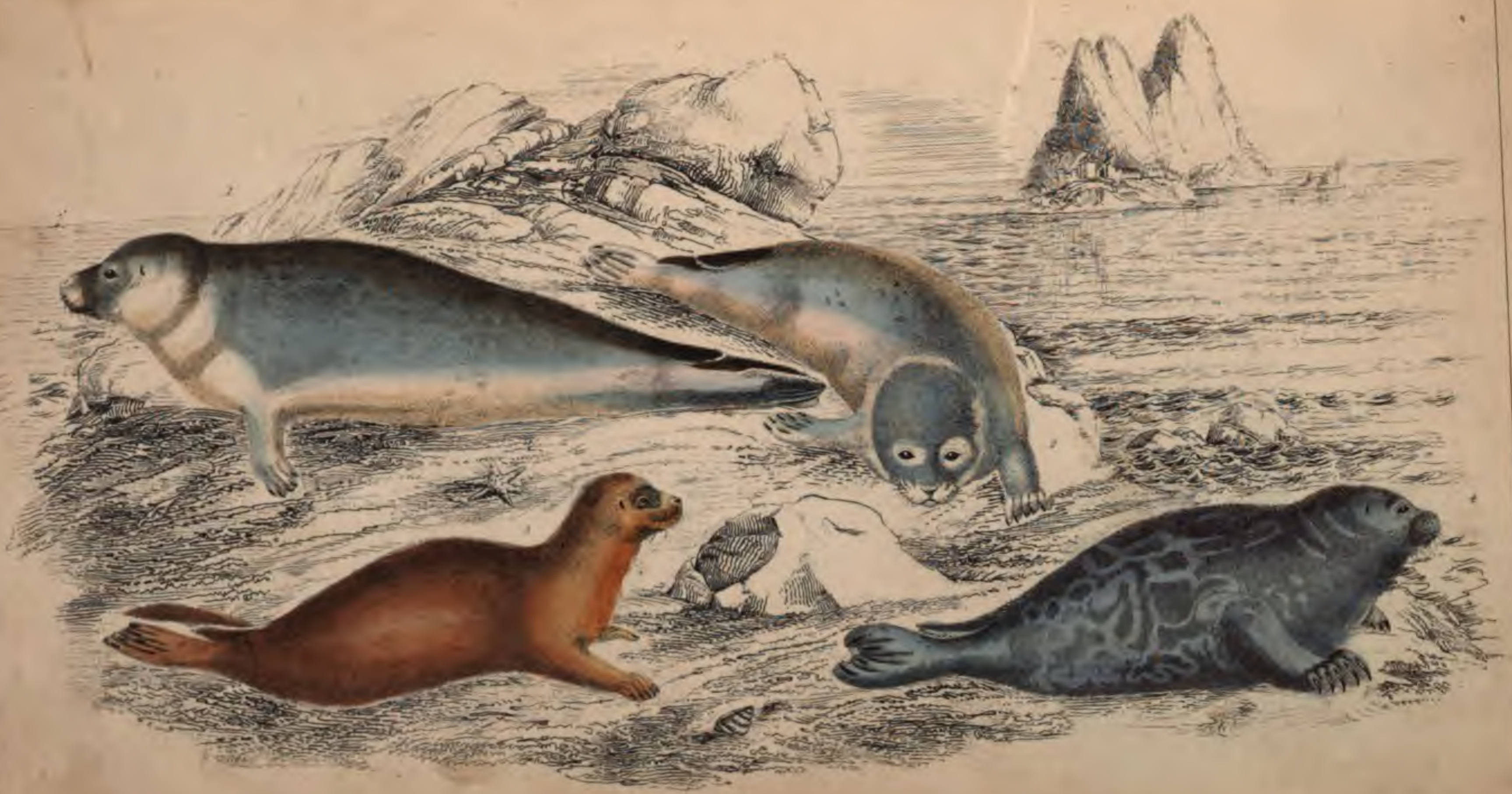

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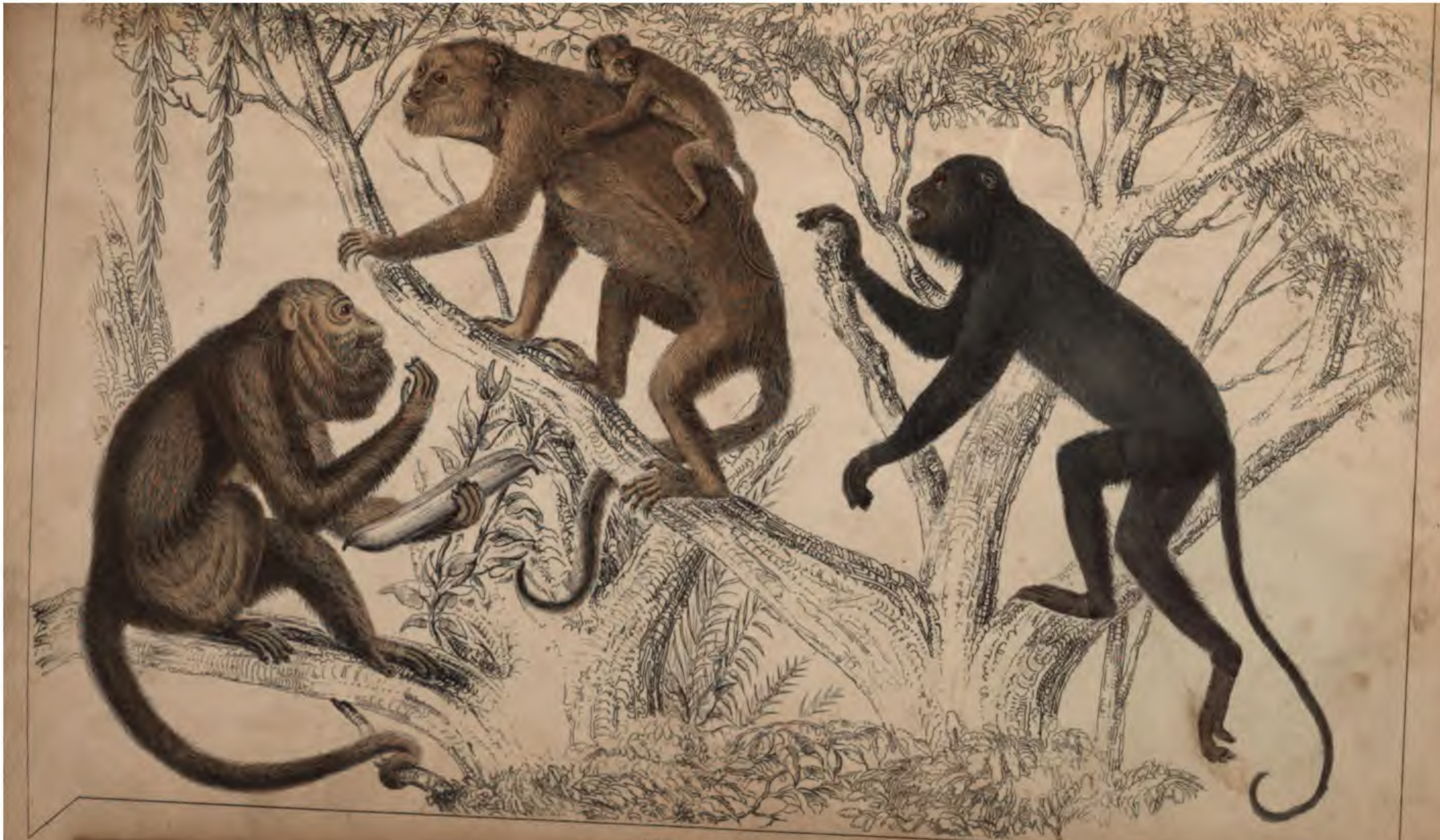

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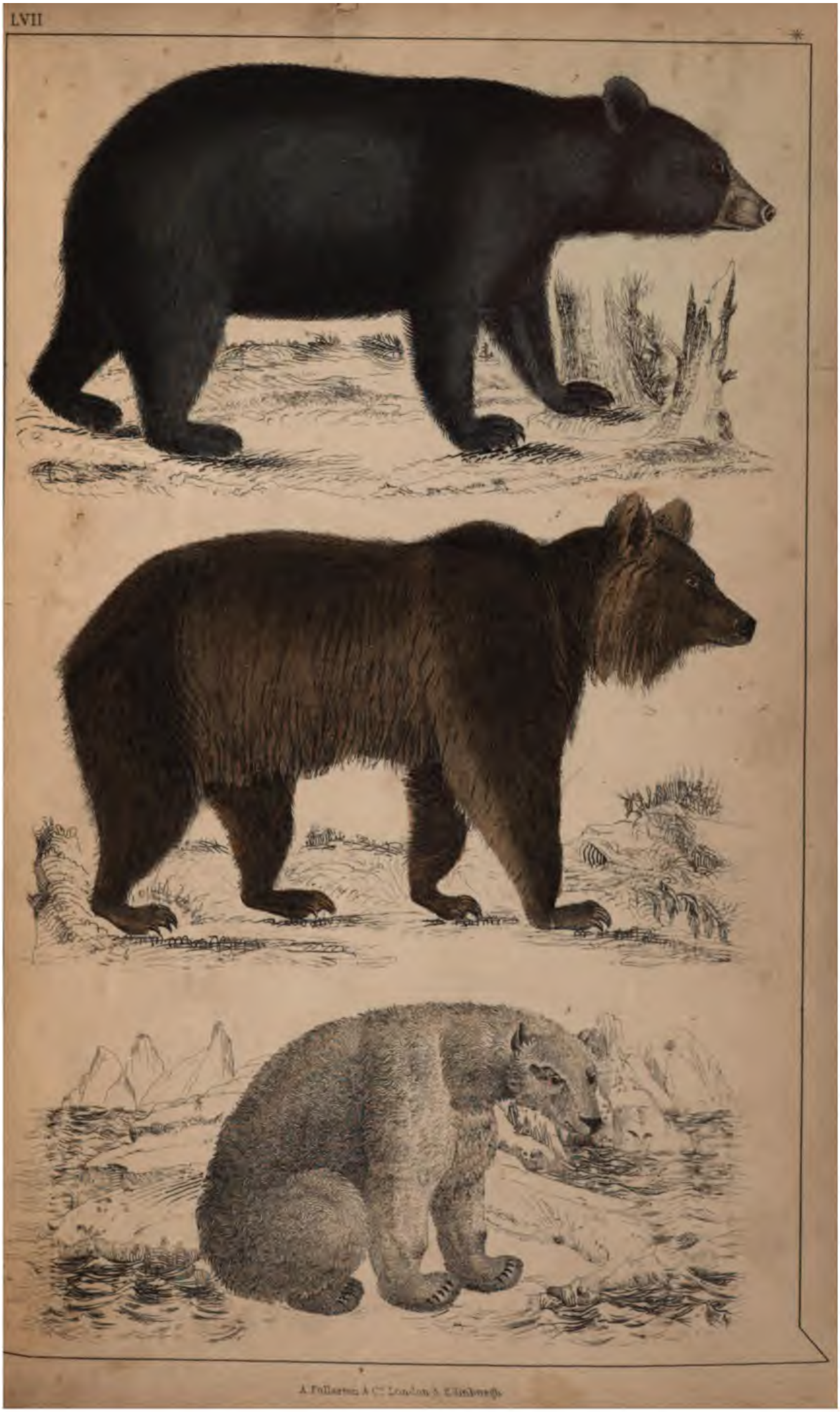

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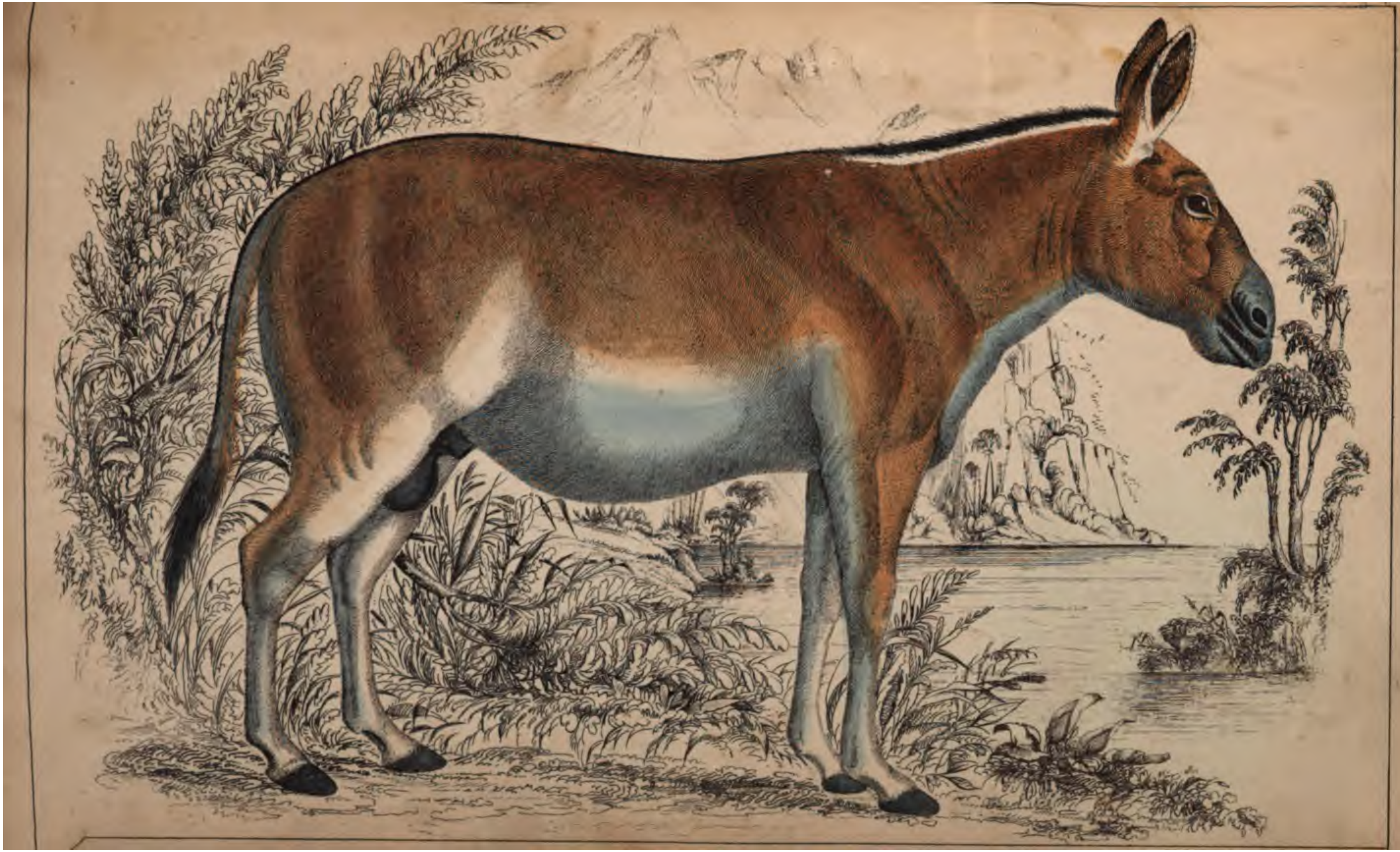

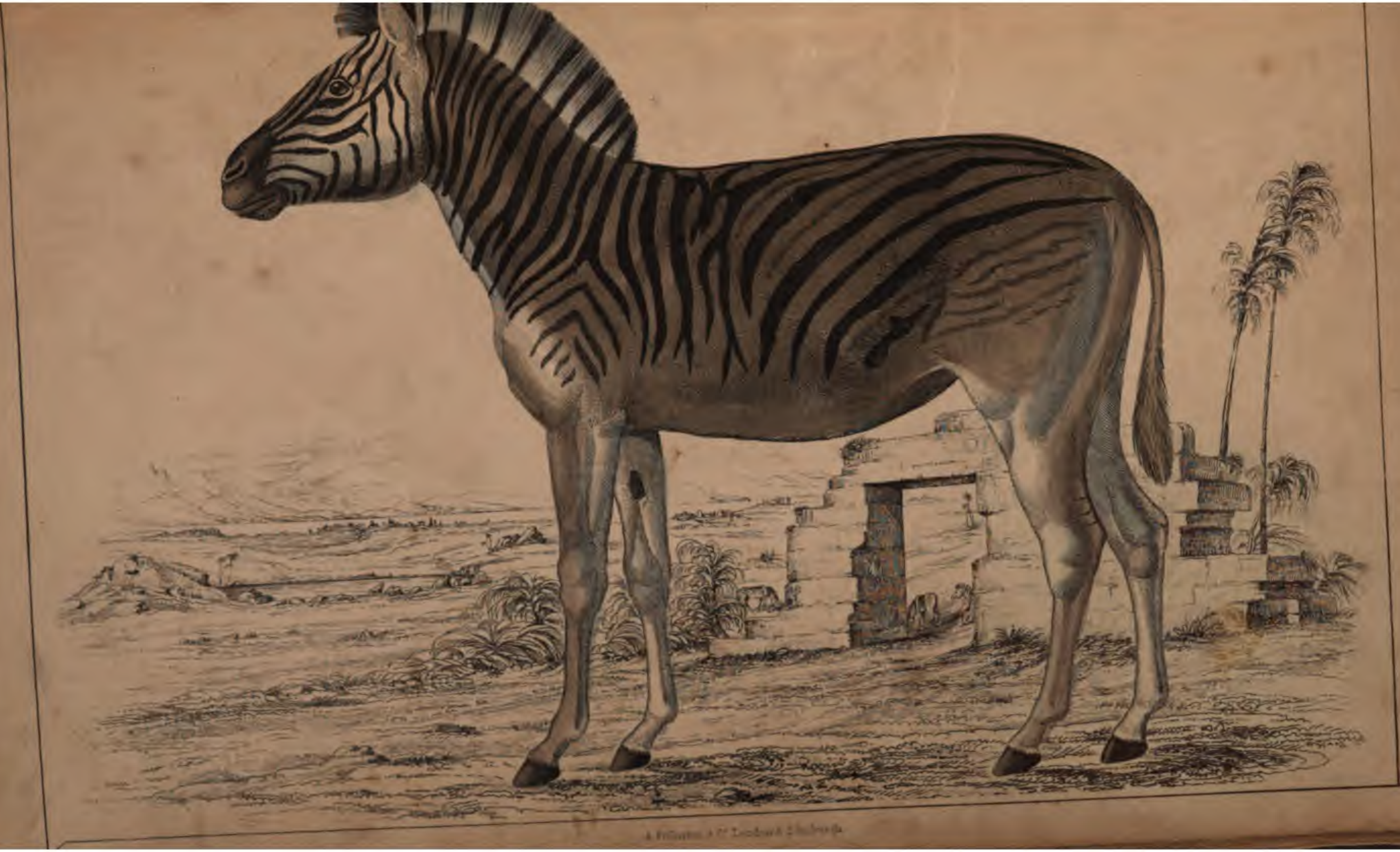

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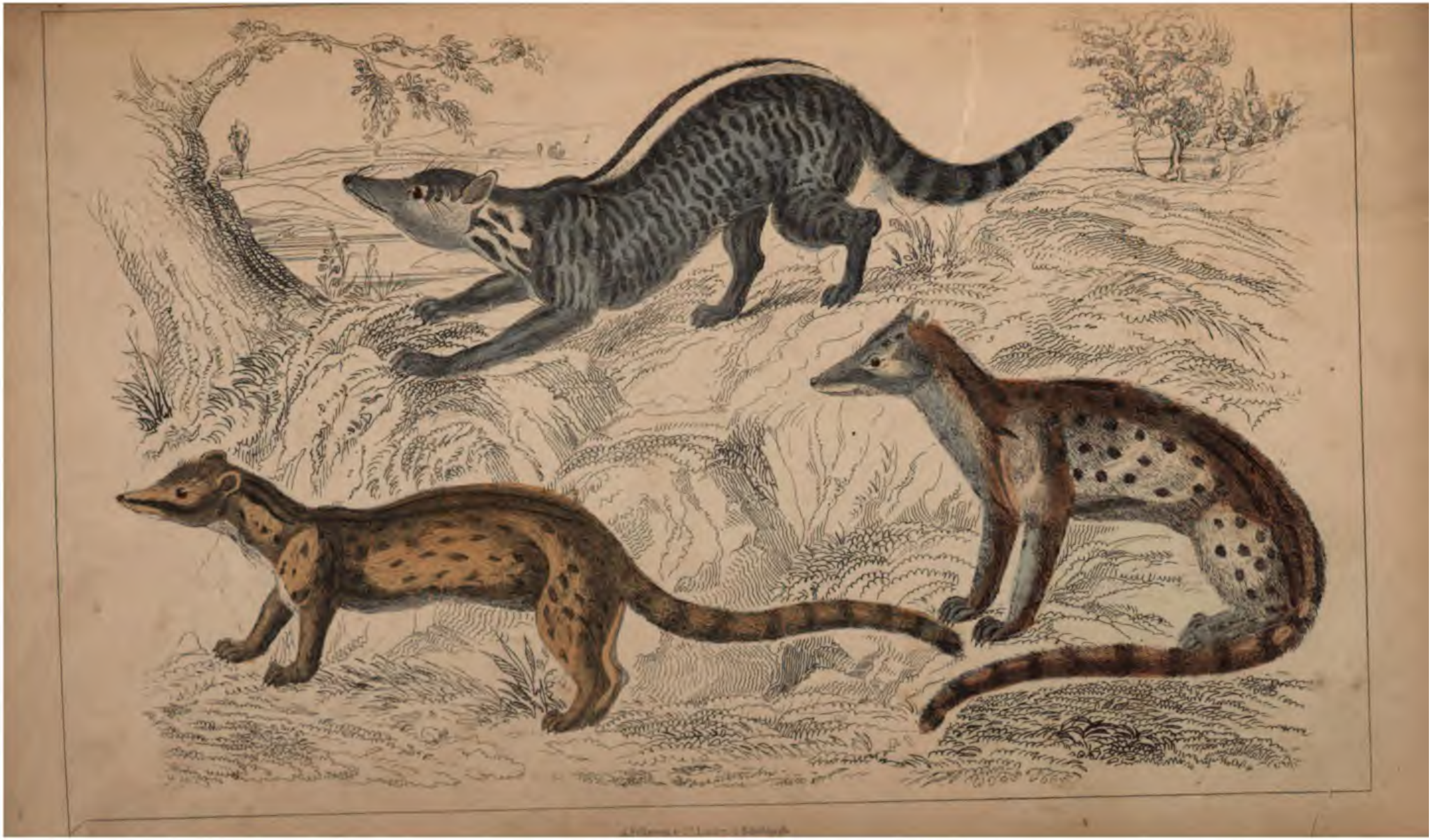

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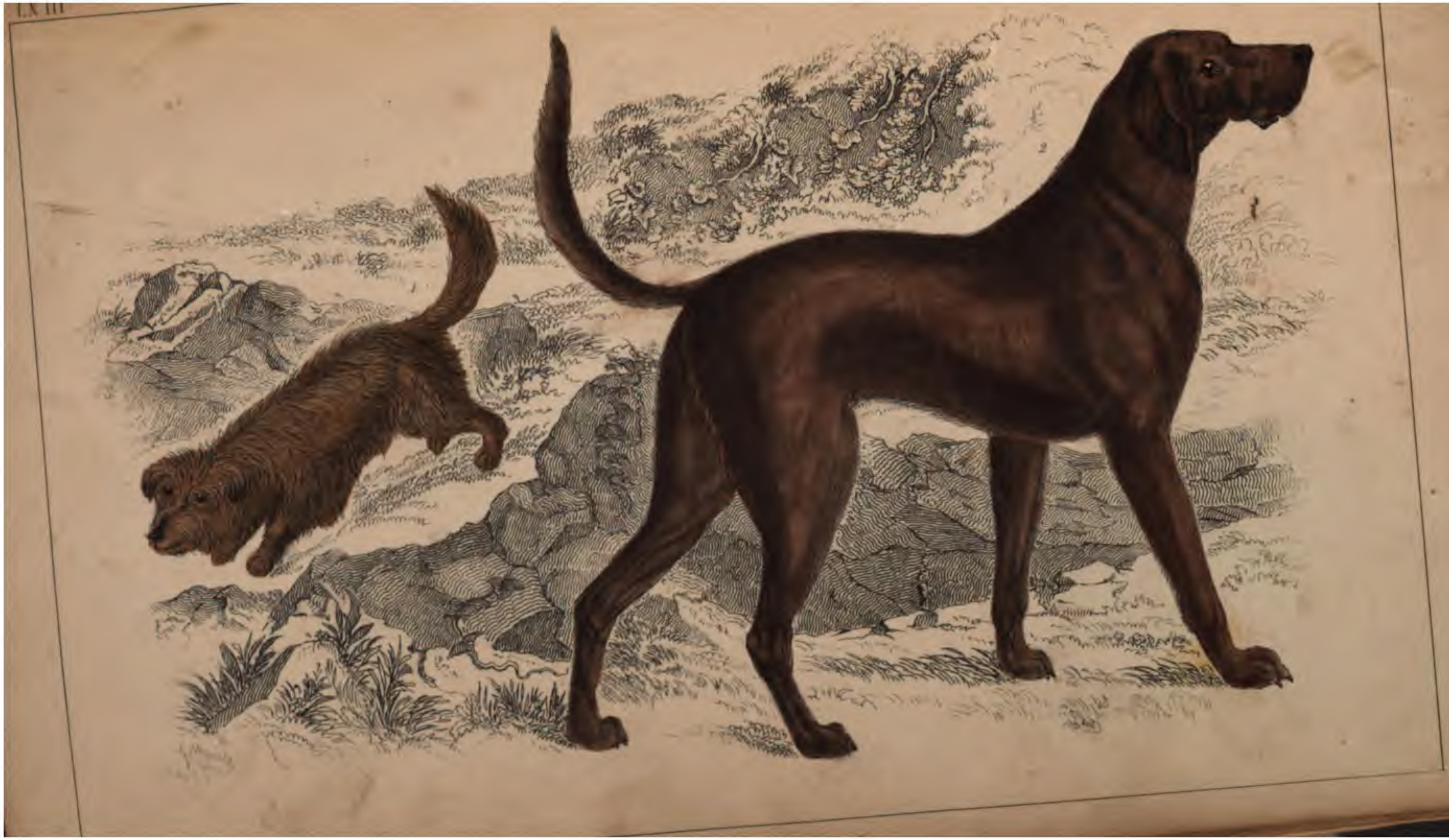

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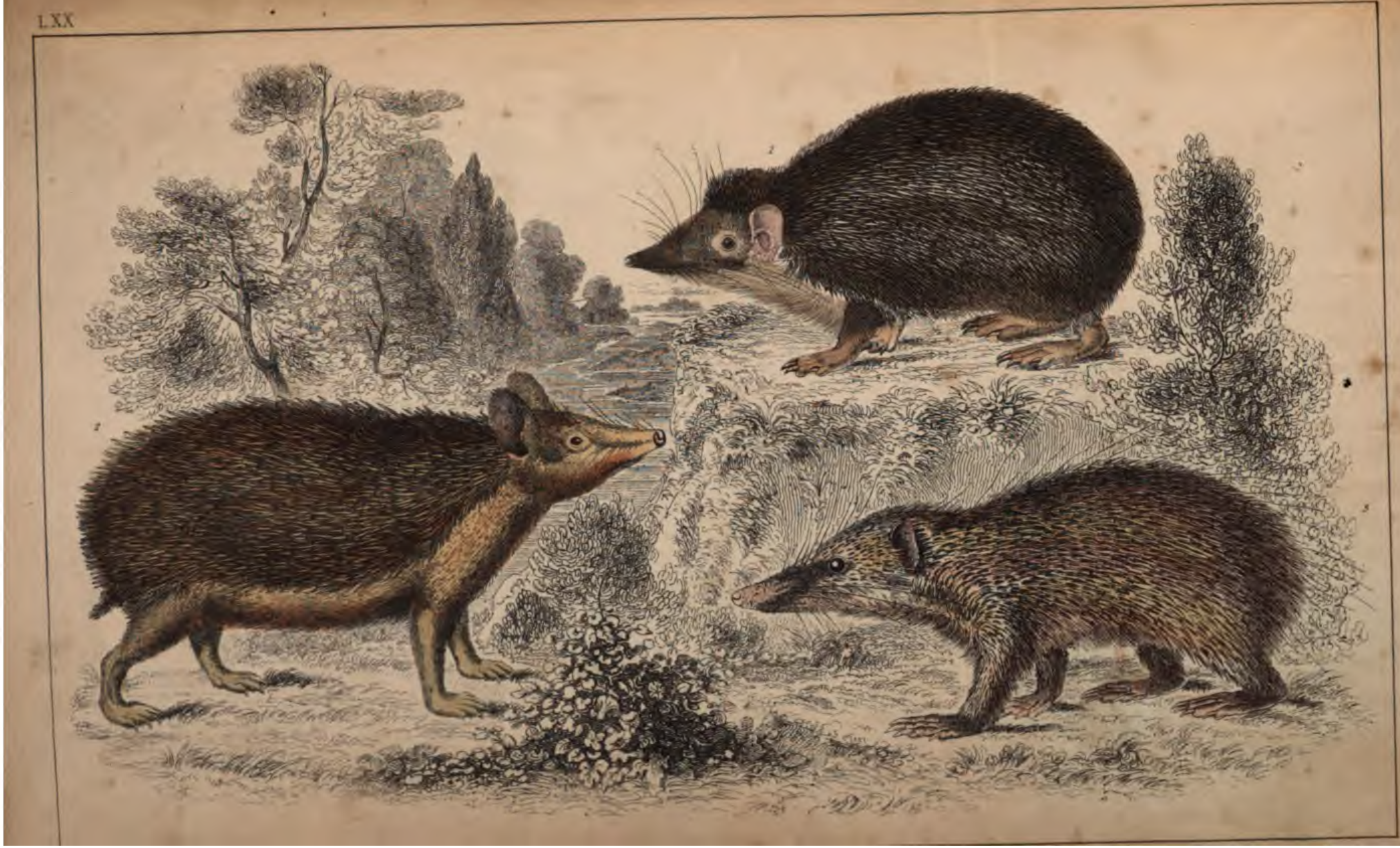

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